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Battelle
. . . Putting Technology To Work

BCLDP
Permit to Install
Application

for

West Jefferson North

To

Ohio Environmental

Protection Agency

April 1, 1996

FOR OFFICE USE ONLY: CHECK APPROPRIATE BOX

___ Air Discharge

___ Water Discharge to New Source Treatment Works

___ Solid Waste Disposal Facility

___ Hazardous Waste Disposal Facility

FOR OFFICE USE ONLY

PTI Application No. _____

Date Received _____

Premise No. _____

OHIO ENVIRONMENTAL PROTECTION AGENCY
APPLICATION FOR PERMIT TO INSTALL

Battelle Memorial Institute

Applicant's Name

505 King Avenue

Mailing Address

Columbus	Franklin	Ohio	43201-2693	(614) 424-6424
City	County	State	Zip	Telephone Number

Eddie R. Swindall, Environmental Support Manager (614) 424-5124

Person to contact (Name and Title and Telephone Number)

East of State Route 142; 1/2 mile south of I-70

Location of Proposed Facility (specific street and number, ie. 555 E. Monroe St.)

1425 Georgesville - Plain City Rd.

Jefferson Township	Madison	43162	8731
City or Township	County	Zip Code	Standard Industrial Classification Code

Directions: A Permit to Install is required for new or modified source of pollution under the provisions of OAC Rule 3745-31. An application cannot be considered complete unless all applicable questions are answered and the required information has been submitted. This application must be signed in accordance with OAC Rule 3745-31-04(B) or it cannot be accepted.

Applications for permits involving air emissions or wastewater treatment facilities will be required to pay a permit to install fee as shown in Section 3745.11(B) and (C) of the Ohio Revised Code. This fee is payable thiry days after the date of final issuance of the permit.

Name of new or modified source or facility: Battelle Columbus Laboratories Decommissioning Project

Product of new or modified source/facility: Buildings and grounds with no radiological restrictions

Will the proposed source/facility involve any of the following: Check all that apply.

A. X Air Discharge
B. ___ Wastewater Treatment Works
C. ___ Solid Waste Disposal Facility
D. ___ Hazardous Waste Disposal Facility

Do you wish to request permit to install registration status via OAC 3745-31-05(E)?

___ yes X no

Under OAC 3745-31-04, These signatures shall constitute personal affirmation that all statements or assertions of fact made in the application are true and complete comply fully with applicable state requirements, and shall subject the signatory to liability under applicable state laws forbidding false or misleading statements.

V. E. Battelberg — 3/29/96

Authorized Signature (for facility) — Date

Operations Manager,
Battelle Columbus Laboratories Decommissioning Project

Title

505 King Ave., Columbus, OH 43201

Address

For Wastewater Treatment Plants

Signature of General Contractor or Agent performing installation, if selected. — Date

Company

Address

OHIO ENVIRONMENTAL PROTECTION AGENCY

INSTALLATION SCHEDULE

THIS FORM CONSTITUTES PART OF THE APPLICATION OF:

FACILITY NAME: Battelle

ADDRESS: St. Rt. 142, West Jefferson, OH

FOR A PERMIT TO INSTALL THE FOLLOWING AIR CONTAMINANT SOURCE:

IDENTIFICATION: Battelle Columbus Laboratories Decommissioning Project

DESCRIPTION: Decommissioning and Decontamination of Buildings and Structures

THE INSTALLATION OF THE ABOVE AIR CONTAMINANT SOURCE IS PLANNED TO FOLLOW THE TIME SCHEDULE DESCRIBED BELOW:

	DATE
1. EQUIPMENT ORDERED	5/1/92
2. COMMENCE CONSTRUCTION	NA
3. STARTUP	6/1/96
4. PERFORMANCE TESTING	6/1/96

Note: If this source has already been installed then you must still fill out this form using the actual dates the above events occured.

THE FOLLOWING INFORMATION MUST BE SUBMITTED ON A SEPARATE PIECE OF PAPER AND ATTACHED TO THIS APPLICATION.

FOR ALL PERMITS TO INSTALL

1. Describe the product or service to be produced by the applicant along with a description of the proposed source/facility.

2. List the name and quantity of all materials and chemicals (solid, liquid, or gaseous) that will be used or produced by the source/facility.

3. State the reason for the application. Is this a new installation, modification to an existing source/facility, reconstruction of an existing source/facility, or startup of a source/facility that has been permanently shutdown for _____ year?

4. Has a previous Ohio EPA application or plan submission been filed for this source/facility? If so, state the date and type of the application previously submitted.

5. Will the proposed source/facility comply with all rules, laws, and regulations of Ohio EPA and U.S. EPA?

FOR AIR POLLUTION SOURCES

6. State the amount of each air contaminant (actual emissions) from each source in pounds per hour and tons per year at maximum and average conditions.

7. Are the proposed sources required to comply with the following federal requirements?
   i. New Source Performance Standards (NSPS)
   ii. National Emission Standards for Hazardous Air Pollutants (NESHAPS)
   iii. Prevention of Significant Deterioration (PSD)
   iv. Appendix "S" - Emission Offset Policy

8. Will the proposed sources employ best available technology?

9. Will the proposed sources cause the significant degradation of air quality?

10. Will the proposed sources interfere with the attainment and maintenance of the ambient air quality standards?

11. Describe any source monitoring, emission monitoring, or control equipment monitoring devices to be installed by the applicant.

12. Will the proposed sources involve the use of asbestos, benzene, beryllium, mercury, or vinyl chloride?

13. Complete and attach an anticipated construction schedule for each proposed source.

14. Please include the estimated cost of any air pollution control equipment to be installed on the proposed sources.

15. An appendix for each air contaminant source must accompany this application. From the following description of the appendices, determine which should accompany your application.

Appendix A - Process: for sources not included in the other appendices.

Appendix B - Fuel-Burning Equipment: for any furnace, boiler, apparatus, and all appurtenances thereto, used in the process of burning fuel with the primary purposes of producing heat or power by indirect heat transfer.

Appendix C - Incinerator: for any equipment, machine, device, article, contrivance, structure or part of a structure used to burn refuse or to process refuse material by burning other than by open burning.

Appendix D - Surface Coating or Printing Operation: for a surface coating operation not included under Appendix K or for a printing operation.

Appendix E - Storage Tank: a storage tank for petroleum liquids.

Appendix H - Gasoline Dispensing Facility: any site where goasoline is dispensed to motor vehicle gasoline tanks from stationary storage tanks.

Appendix J - Loading Rack at a Bulk Gasoline Plant or Terminal: an operation for transferring gasoline to a delivery vessel.

Appendix K - Surface coating line: a coating line consists of one or more coating applicators, flash-off areas or ovens to be used for the following: an automobile or light-duty truck assembly plant; can manufacturing; coil-coating; fabric coating; large appliance coating; magnet wire coating; metal furniture coating; paper coating; vinyl coating.

Appendix L - Solvent Metal Cleaning: an operation employing solvent for cleaning metal surfaces; wipe-cleaning is excluded.

Appendix M - Fugitive Dust Emission Sources (See List Below)

Appendix O - Dry Cleaning Facility

Appendix P - Landfill

General:

M1-1 - Plant Roadways and Parking Areas
M1-2 - Aggregate Storage Piles
M1-3 - Material Handling
M1-4 - Mineral Extraction

Iron and Steel Mills:
- M2-1 - Coke Manufacturing
- M2-2 - Iron Production
- M2-3 - Steel Manufacture

M3 - Lime Plants
M4 - Power Plants
M5 - Grain Terminals
M6 - Country Grain Elevators
M7 - Gray Iron Foundries
M8 - Steel Foundries
M9 - Glass Manufacturing
M10 - Fiberglass Manufacturing
M11 - Secondary Aluminum Processing Plt
M12 - Fertilizer Mixing/Blending Plants
M13 - Cement Manufacturing & Blending Plans
M14 - Ferroalloy Production
M15 - Metal Salvage Operations
M16 - Pulp and Paper Mills
M17 - Woodworking Operations
M18 - Aggregates Processing Plants
M19 - Coal Processing Plants
M20 - Brick & Related Clay Product Mfg. Plts.
M21 - Asphaltic Concrete Plants
M22 - Concrete Batching Plants
M23 - Sandblasting Operations
M24 - Petroleum Refineries
M25 - Agricultural Chemical Mfg Plts.
M26 - Bulk Gasoline Terminals
M27 - Carbon Black Plants
M28 - Municipal Incineration
M29 - Salt Processing Operations
M30 - Galvanizing Plants

FOR WASTEWATER DISCHARGES

16. State the anticipated quality of all types of environmental pollutants to be discharged by the facility.

17. State in detail the method for disposal for all environmental pollutants listed in the question above. This should include a complete description of any control equipment to be employed.

18. If wastewater is to be discharged to a surface water, state the anticipated concentration (mg/l) and loading (lbs/day) in the discharge, and the effect this discharge will have on the surface water under critical conditions.

19. If wastewater is to be discharged to the groundwater, state the anticipated concentration (mg/l) and loading (lbs/day) in the wastewater, and the effect this wastewater will have on the groundwater.

20. If wastewater is to be discharged to a sewerage system, what will be the effect on the sewerage system and wastewater treatment system.

21. Describe any monitoring equipment to be installed at the facility.

22. Will the proposed source conform with area-wide waste management plans for wastewater treatment?

23. General plans for approval of the proposed source should be submitted to demonstrate compliance with OAC Rule 3745-31-05.

24. The following information should be included with the application (if applicable).

i. Appendix G. Extended Aeration Wastewater Treatment Facility Data Sheet
ii. Pump Station Data Sheet
iii. Sanitary Sewer Data Sheet
iv. Application for Approval of Plans for collection, treatment, and disposal of wastewater.

FOR SOLID WASTE DISPOSAL FACILITIES

25. State the anticipated quality of all types of environmental pollutants to be discharged by the facility.

26. State in detail the method for disposal for all environmental pollutants listed in the question above. This should include a complete description of any control equipment to be employed.

27. Describe any ground water or surface stream monitoring systems to be installed at the facility.

28. State the local zoning requirements.

29. Will the proposed source conform with area-wide waste management plans for solid waste?

30. An Appendix F - Solid Wastes Disposal Facility must be included with this application.

PERMIT TO INSTALL APPLICATION FOR
BATTELLE - WEST JEFFERSON FACILITY
BATTELLE COLUMBUS LABORATORIES DECOMMISSIONING PROJECT

Item #	Comment
1	Nuclear research and development (R&D) activities have been conducted for the U.S. Department of Energy (DOE), its predecessor agencies, and other commercial contracts over a period of approximately 43 years within portions of three buildings (JN-1, JN-2, and JN-3) at the north area of Battelle's West Jefferson Site. As a result of these R&D activities, these buildings at the West Jefferson North area have become contaminated with varying amounts of radioactive materials. The Battelle Columbus Laboratory Decommissioning Project (BCLDP) is dedicated to decommission and decontaminate (D&D) each of these buildings in order that they may be released for other uses without radiological restrictions. The BCLDP is funded jointly by Battelle and DOE. Decontamination activities will be performed by Battelle or through the use of contractors. The approach for decommissioning these facilities is to decontaminate and remove radioactive contaminated equipment, materials, and soils. This involves the dismantlement and/or removal of equipment; decontamination of building structures and appropriate restoration of the buildings; and disposal of waste at an approved disposal site. The majority of contamination is affixed to building surfaces (i.e. -- walls, floors, structural members). Decontamination of the facility will involve the use of approved methods in accordance with the approved D&D plan. The principle methods of decontamination to be utilized are Vacuum Abrasive Blasting, Concrete Sawing, and Removable Paint. Decontamination methods that could lead to airborne contamination (primarily Vacuum Abrasive Blasting) will employ multiple stage filtration systems to protect both workers and the public, as well as to reduce the possible emissions of radioactive materials to the environment. The decontamination equipment will be equipped with a rough and high efficiency particulate air (HEPA) filters, in series, and will exhaust to the HEPA intake area for the work area. The work areas will be isolated and maintained as closed systems under negative pressure and the exhaust air will be filtered using a rough filter and dual HEPA filter system. All HEPA filters are dioctyl phthalate (DOP) tested annually and after filter change in accordance with BCLDP procedures. There will be no new sources of air emissions which result from the D&D operation as the exhaust vents from all

1 (cont.) temporary work areas constructed within the buildings will vent inside the buildings. The building ventilation will act as a final filtration system for exhaust air generated from these work areas.

Several exhaust vents presently exist in the buildings slated for decommissioning; therefore, these vents are also included in this PTI application. Most of these vents are equipped with HEPA filters and continuous air monitors. Also included is the vent from the JN-1 evaporator. The evaporator is periodically utilized to reduce waste water from the Radioanalytical Laboratory and radiologically controlled area mop water to vapor and sludge. Presently, a minimal volume of water is treated in the evaporator annually. A table summarizing the volume of liquid waste materials processed in the evaporator during 1994 and 1995 is included in **Tables of Chemical Data**. The D&D operations are expected to generate minimal additional waste water to be processed as "dry" decontamination methods will be emphasized. Water vapor from the evaporator passes through a rough filter and dual HEPA filter system prior to discharge into the atmosphere. Humidity controls prevent an accumulation of water vapor on the filters. The sludge which accumulates in the evaporator is periodically removed and disposed of as radiologically contaminated waste subsequent to proper testing to ensure the waste is not hazardous. The **Table of Existing Vents**, lists each of the existing vents, including its location, source, control, and potential types of contaminant(s). It should be noted that as the D&D process progresses, existing vents in the affected buildings in the north area will be decommissioned, and therefore, will no longer be potential sources of air contaminants.

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2 Chemicals will not be produced by the D&D process. Radionuclides which presently exist in the buildings will be removed as radioactive waste to proper disposal sites. A complete inventory of radionuclides is included in the Comply run found in **Emissions Data.** The radioactive waste will be in the form of packaged equipment, building components (i.e. -- light fixtures, conduit, ventilation duct), and particulate. Some nonhazardous cleaning chemicals (similar to household cleaners) will be used to remove surface contamination on building and equipment surfaces. These cleaners are sprayed on and wiped off. An estimated waste inventory has been included in **Tables of Chemical Data.** Cleaning, maintenance, and laboratory chemicals used and stored in buildings JN-1, JN-2, and JN-3 have been inventoried according to work area by BCLDP staff. This information has been included in **Tables of Chemical Data**. Please note that most of these chemicals are stored in quantities of less than one gallon. A table describing JN-2 Radioanalytical Laboratory waste water volumes for 1994 and 1995 is also included in **Tables of Chemical Data.**

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3 This application is for a new source. D&D activities are expected to begin in 1996 and continue for approximately four years. It should be noted that emissions generated from the D&D activities will ultimately discharge through existing ventilation systems. Upon completion of the BCLDP all air sources in buildings JN-1, JN-2, and JN-3 will be eliminated.

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4 This process has had no previous plans or applications. A number of air permits have been obtained for other non-BCLDP related activities at this facility. BCLDP related activities at the King Avenue site and the pool water evaporation activities at the West Jefferson site were both exempted from permitting as per Ohio EPA correspondence of August 13, 1991 from Mr. Jay McCoy and August 8, 1991 from Mr. Donald R.Schregardus, respectively.

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5 The proposed facility will comply with rules, laws, and regulations of Ohio EPA and USEPA. In addition, the proposed source will comply with Nuclear Regulatory Commission (NRC) rules and license requirements as well as applicable DOE requirements.

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6 While it is not practical to state the emissions of each air contaminant in pounds per hour or tons per year due to the small quantities involved, an attempt has been made to comply with this request. A spreadsheet depicts the radionuclide emissions from the West Jefferson North site stacks. This data was taken from the enclosed *Site Environmental Report*. The estimated release of particulate matter (PM) is based on historical data gathered during vacuum abrasive blasting at the King Avenue campus and specifications provided by the manufacturer of the blasting units. Both items are enclosed in **Emissions Data**.

Battelle Memorial Institute was in compliance with the provisions cited in 40 CFR 61 Subpart I during 1994. The annual effective dose equivalent (EDE) was calculated for the West Jefferson North facilities using the EPA Comply Code, as specified in section 61.103(a). The annual EDE is significantly less than 10 percent of the dose standard proposed by 40 CFR 61, Subpart I, Section 61.102 for all radioactive materials and radio-iodine categories for the West Jefferson North site. A copy of the latest Comply Code is enclosed (this Comply run includes all radionuclides available for release at the North site). A copy of the letter sent to the USEPA that demonstrates compliance with 40 CFR 61 for 1994 is enclosed. The COMPLY run for 1995 was not available when this application was prepared.

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7 The proposed source will not be required to comply with :

i. New Source Performance Standards
ii. Prevention of Significant Deterioration
iii. Appendix S - Emission Offset Policy

40 CFR 61 Subpart I (i.e., The National Emission Standards for Radionuclide Emissions from Facilities Licensed by the Nuclear Regulatory Commission and Federal Facilities - NESHAPS) is applicable to the West Jefferson North site.

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8 The proposed source will use the best available technology.

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9 The proposed source will not cause any significant deterioration of air quality or pose any risk of exposure to site employees or the general public. An Environmental Assessment (EA) was prepared for the project and reviewed by DOE, Ohio EPA, and the Ohio Department of Health. It was determined through a Finding of No Significant Impact (FONSI) that there would be no significant impact on human health or the environment.

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10 The proposed source will not interfere with the maintenance of ambient air quality standards.

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11 An existing environmental monitoring program will continue for the duration of the BCLDP. This monitoring program is designed to meet the requirements of Battelle's NRC license and to assure compliance with DOE Orders 5400.1, *General Environmental Protection Program*, and 5400.5, *Radiation Protection of the Public and the Environment*. The program consists of routine surveys, air and water monitoring, and environmental samples of soil, sediment, grass, food crops, and fish. Numerous copies of the BCLDP Site Environmental Report (SER) are sent to Ohio EPA, annually. A copy of the most recent SER is enclosed.

Control equipment monitoring consists of equipping HEPA filter systems with a pressure gauge to monitor filter performance. If the pressure drop moves outside a preset range (i.e., too low signifying filter malfunction and too high signifying the need to replace filters) operations will be stopped and the filters changed. In addition, continuous air monitors will be employed in the work area to monitor the build up of airborne radioactive contamination.

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12 The proposed source will not involve the use of asbestos, benzene, beryllium,

12 (cont.)	mercury, or vinyl chloride. However, asbestos containing building materials may need to be decontaminated or removed in order to access other areas. The most obvious example is pipe insulation. If the insulation cannot be wiped clean it will be removed for disposal. The removal, packaging, and disposal will be accomplished by licensed personnel in accordance with the applicable asbestos regulations. Although a survey was performed, the amount of asbestos containing building materials to be removed cannot be determined at this time. If the amount to be removed in an area is greater than the standard contained in OAC 3745-20-03, a notification form will be sent to Ohio EPA.
13	D&D activities in buildings JN-1, JN-2, and JN-3 will begin in 1996 and are scheduled to last approximately four years. All other sources included in this PTI application are previously existing.
14	The air pollution control equipment to be utilized during D&D activities has already been purchased by Battelle for BCLDP.
15	A completed Appendix A, *Process Data* is attached for the BCLDP as well as for all existing air sources in buildings scheduled for D&D operations at the West Jefferson North site.
16-24	No wastewater discharge will result from the operation. The minimal amounts of water used in D&D operations will evaporate within the contaminated areas. Wastewater from the Radioanalytical Laboratory is sent to the JN-1 evaporator for evaporation.
25-30	This is not a solid waste disposal facility. All radiological residues will be disposed of at a proper DOE disposal facility. Non-radioactive residues will be disposed of in accordance with Federal, state, and local solid waste regulations.

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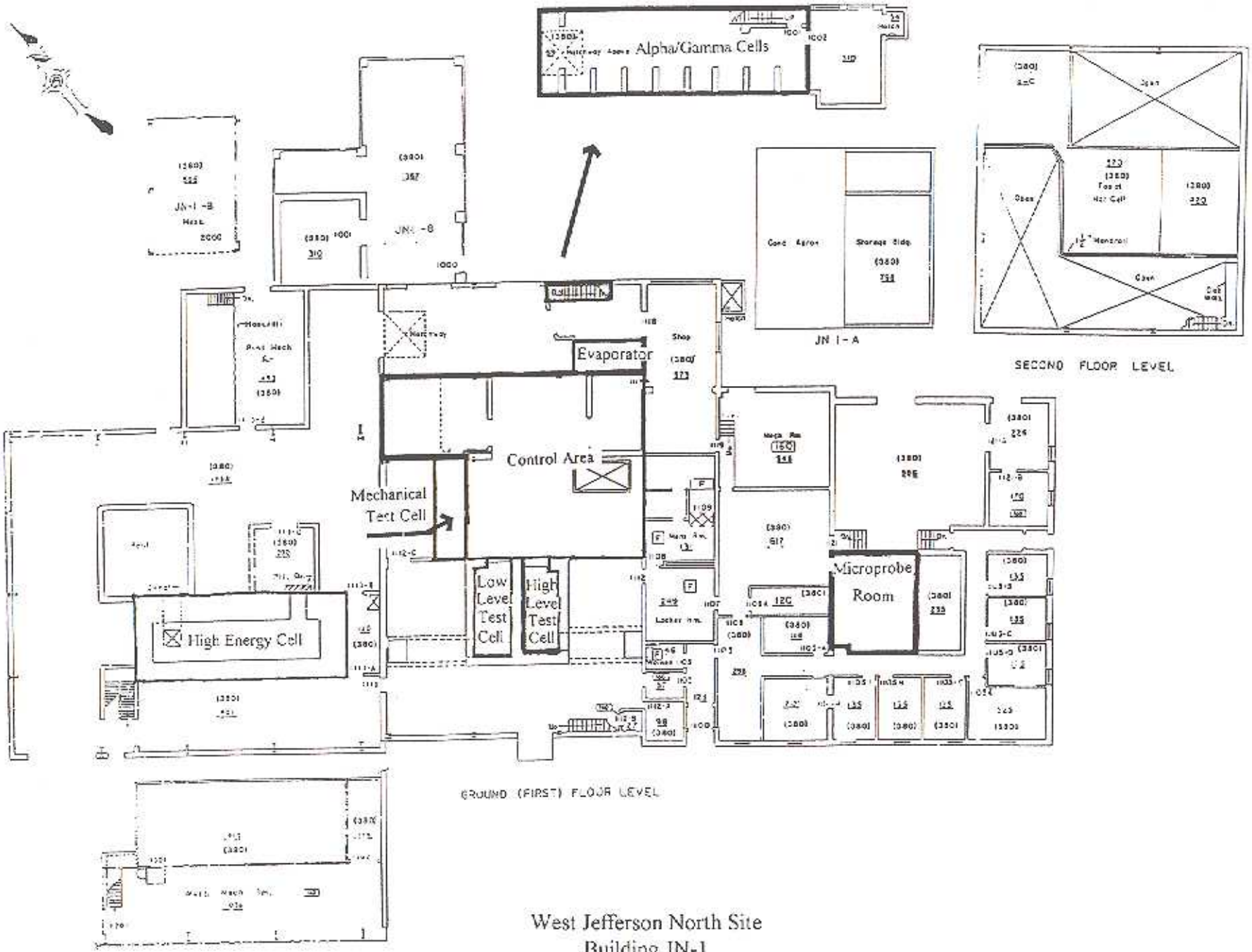
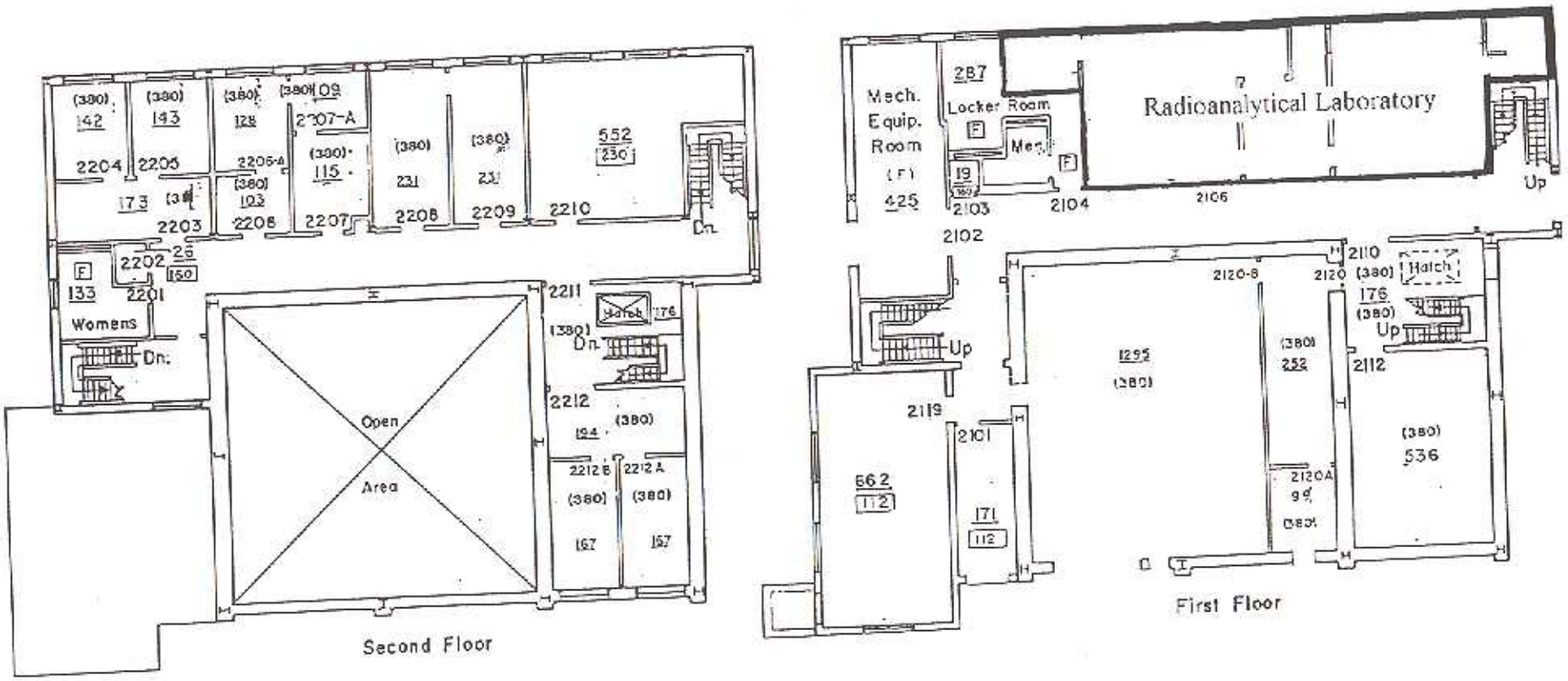
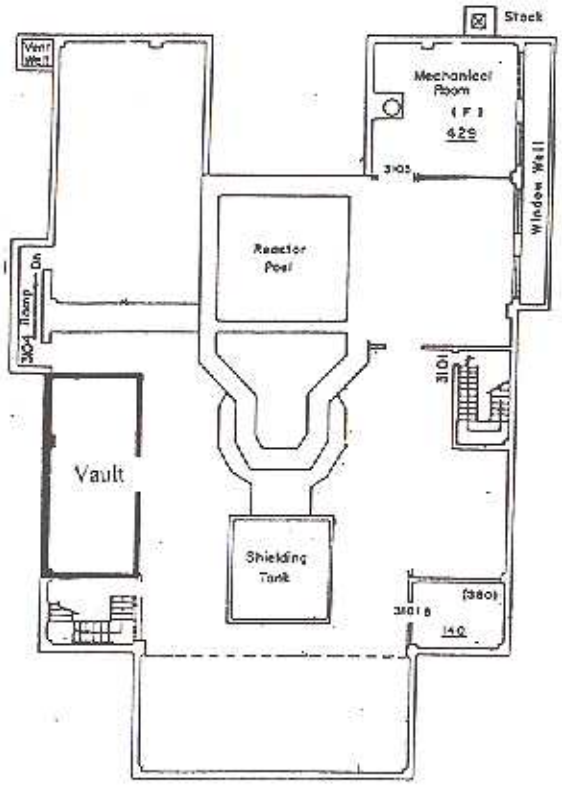


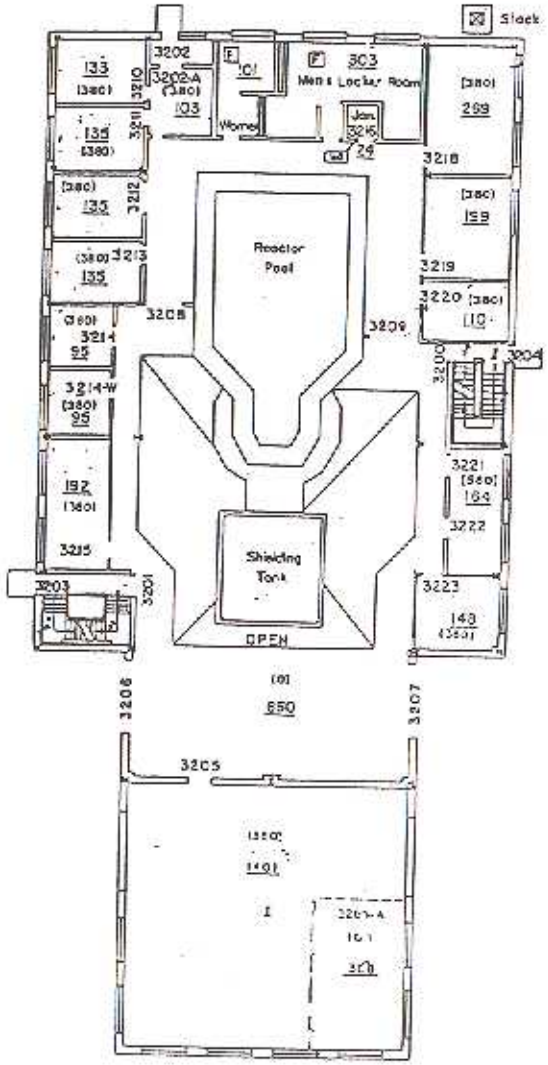
West Jefferson North Site
Building JN-1
(not to scale)



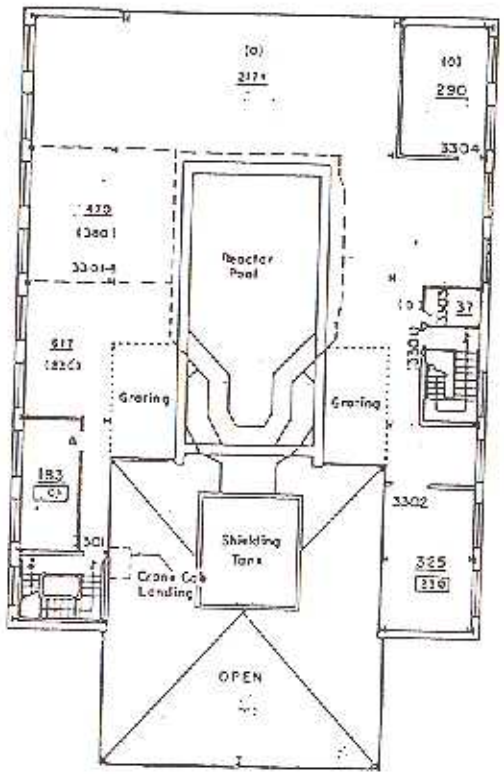
West Jefferson North Site
Building JN-2
(not to scale)



BASEMENT FLOOR PLAN



GROUND FLOOR PLAN



SECOND FLOOR PLAN

West Jefferson North Site
Building JN-3
(not to scale)

FOR OFFICIAL USE ONLY

Premise No. _____
Source No. _____

APPENDIX A, PROCESS

PROCESS DATA

1. Name of process: BCLDP - West Jefferson

2. End product of this process: Buildings and Grounds with no Radiological Restrictions

3. Primary process equipment: Various - See notes

   Your identification: NA - See notes Year Installed: NA

4. Manufacturer: NA - See notes Make or Model: NA - See notes

5. Capacity of equipment (lbs./hr): Rated: See notes Max.: See notes

6. Method of exhaust ventilation: ☒ Stack ☐ Window fan ☐ Roof vent ☒ Other, describe: See notes

   Are there multiple exhausts? ☐ Yes ☐ No

OPERATING DATA

7. Normal operating schedule: 8 hrs./day, 5 days/wk., 52 wks./year.

8. Percent annual production (finished units) by season:
   Winter 25 Spring 25 Summer 25 Fall 25

9. Hourly production rates (lbs.): Average: See notes Maximum: See notes

10. Annual production (indicate units): NA - See notes
    Projected percent annual increase in production: NA

11. Type of operation: ☐ Continuous ☒ Batch

12. If batch, indicate Minutes per cycle: NA Minutes between cycles: NA - See notes

13. Materials used in process: See notes

List of Raw Materials	Principal Use	Amounts (lbs./hr.)
Radiologically Contaminated buildings and equipment		
Non-Hazardous cleaning agent	Surface Decontamination	<1

14. A PROCESS FLOW DIAGRAM MUST BE INCLUDED WITH THIS APPENDIX. Show entry and exit points of all raw materials, intermediate products, by-products and finished products. Label all materials including airborne contaminants and other waste materials. Label the process equipment and control equipment.

(continued on reverse side)

NOTES ON APPENDIX A, PROCESS
PERMIT TO INSTALL APPLICATION FOR
BATTELLE - WEST JEFFERSON FACILITY
BATTELLE COLUMBUS LABORATORIES DECOMMISSIONING PROJECT

Item #	Comment
3	No primary process equipment will be used. Various technologies described in the PTI will be used for removing fixed contamination from surfaces. The technology to be used is determined after a detailed characterization of the type and extent of contamination. It is predicted at this time that the primary means of mechanical decontamination will be Vacuum Abrasive Blasting.
4	The manufacturer of the Vacuum Abrasive Blasting units used by the BCLDP is LTC Americas Inc. and the unit model is LTC 1060 with HEPA kit. In all other cases the manufacturer of the technology is dependant on the equipment to be used. Specific model numbers of equipment are not available until the technology is chosen.
5	It is not practical to provide capacity of the equipment in terms of pounds per hour. Decontamination equipment is usually rated in units of surface area over time and decontamination activities will vary in completion time due to complexity. Due to the work already completed at the King Avenue Campus, the BCLDP has found that approximately 50-60 ft^2 of surface can be blasted in one hour.
6	The decontamination and decommissioning (D&D) is to be accomplished in phases within three separate buildings over a four year time period. Individual work areas will be created within the three buildings when needed. If the work to be accomplished has the potential for air emissions, the work area will be enclosed and kept at a negative pressure through the use of HEPA ventilation. The system will exhaust into the building. Whenever feasible the D&D of individual test cells will be contained within that cell and will utilize the control equipment of the existing cell exhaust system.
9-10	As no product is being generated, hourly and annual production rates are inapplicable.

12	As indicated previously, the project will be completed in phases after characterization. Diagrams of the buildings to be decontaminated are enclosed.
13	The bulk of the work will consist of the removal of contaminated material. Raw materials will only be used when surface contamination can be removed using a nonhazardous cleaning agent. The cleaning agents to be utilized were selected through a waste minimization process designed to eliminate the generation of mixed waste (i.e., waste that is both RCRA hazardous and radioactive).
14	See attached diagram.
15	Most operations during D&D will utilize control equipment to contain contamination at the point of generation. Temporary work area enclosures will be equipped with HEPA filter protected ventilation systems. The HEPA filters used by the will be manufactured by American Air Filter Company; however, model numbers, dates of installation, and pressure drop across filters will vary depending on the filter's placement.
16-20	Work area will exhaust through existing ventilation systems detailed elsewhere in this application. As a result, stack and exhaust air characterization is not applicable.
21	Radiation monitors to be used within and outside of the work areas are state-of-the-art. The model numbers of radiation air monitors expected to be used are: Alpha - Eberline Alpha Model 3 or Model 5; Beta/Gamma - Eberline Beta/Gamma Model AMS 4 or Model AM-3A. Equivalent models may also be used. In addition more advanced units may be utilized as they become available.
22	A copy of the *BCLDP Site Environmental Report* (SER) is enclosed. The SER provides environmental data obtained during the calendar year by the BCLDP. Emissions data is included in the SER. Multiple copies of the SER are provided to the Ohio EPA annually.

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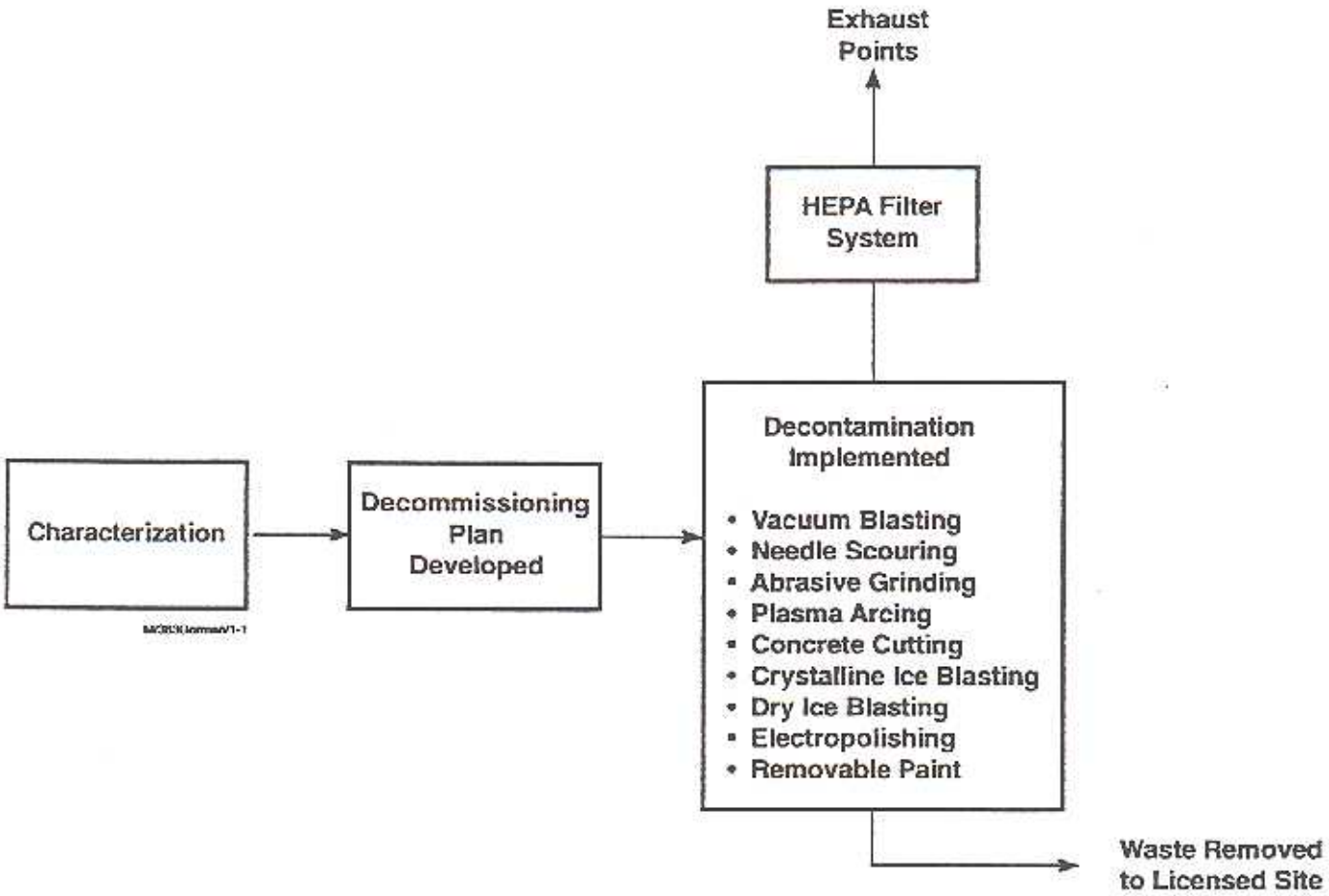
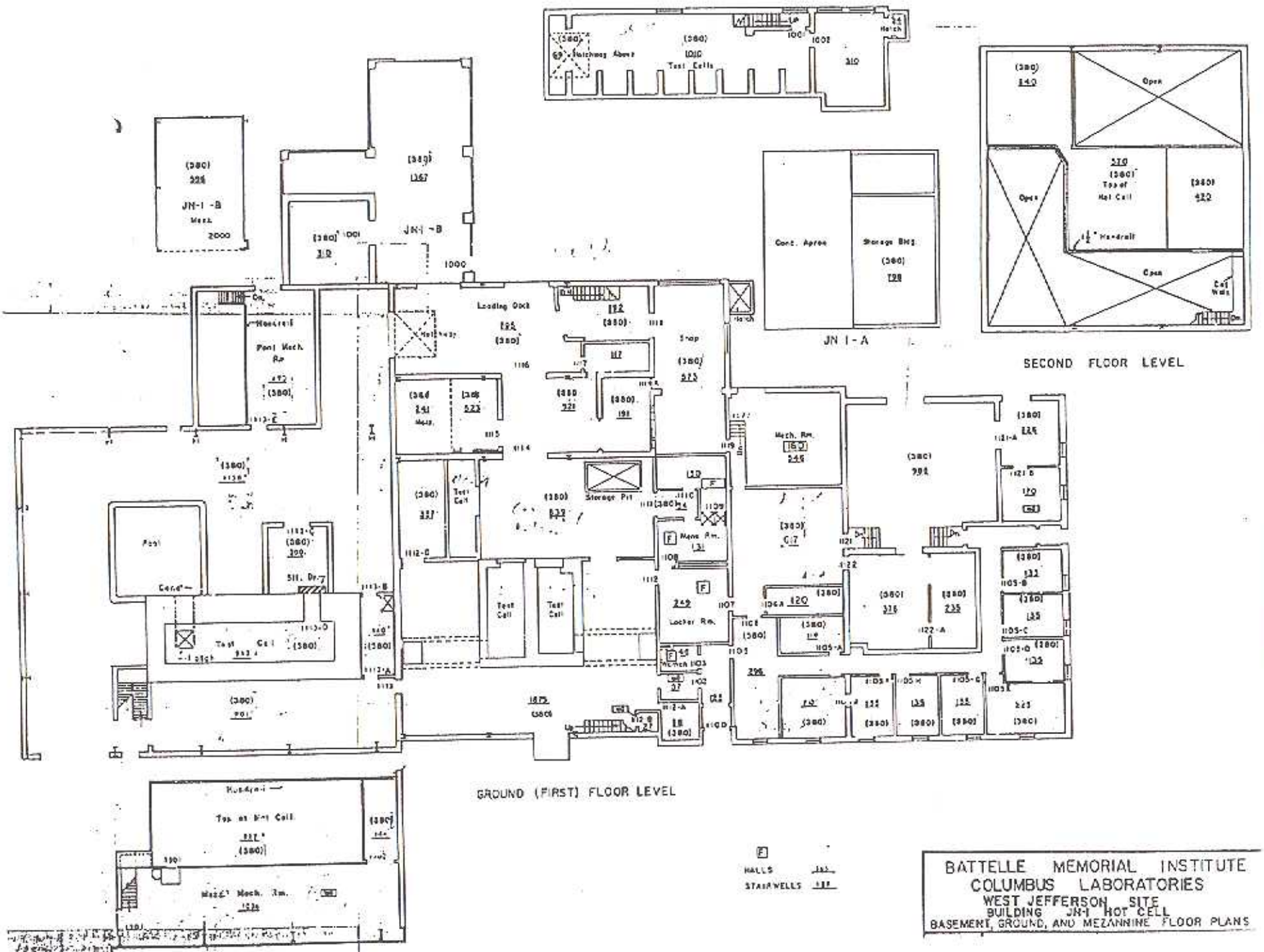
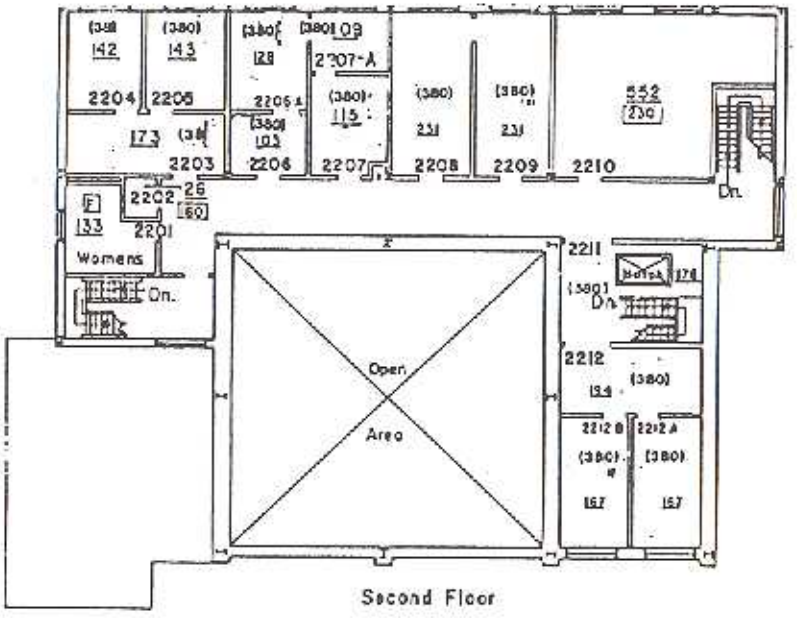
Battelle Columbus Laboratories Decommissioning Project -
West Jefferson Facility

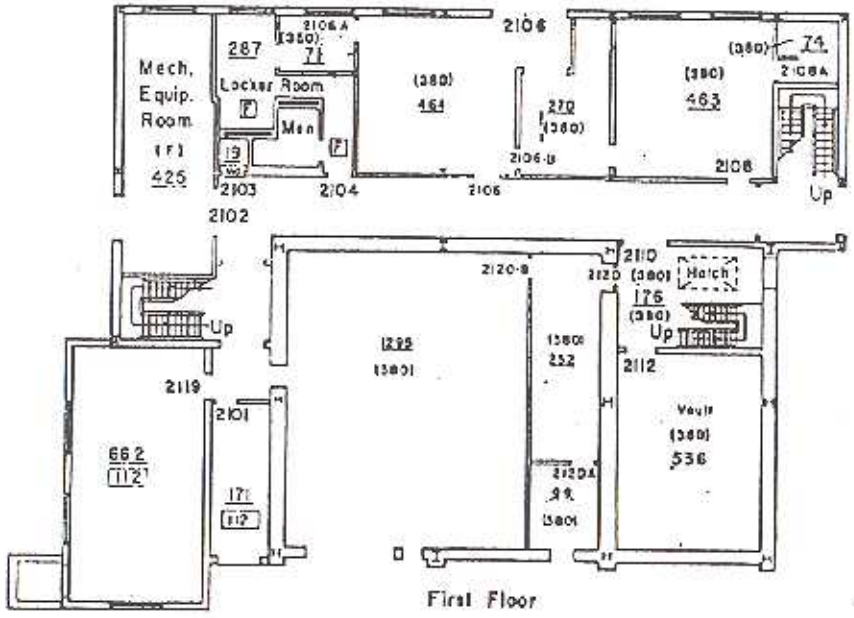


Item 14. Process Flow Diagram



BATTELLE MEMORIAL INSTITUTE
COLUMBUS LABORATORIES
WEST JEFFERSON SITE
BUILDING JN-1 HOT CELL
BASEMENT, GROUND, AND MEZZANNINE FLOOR PLANS

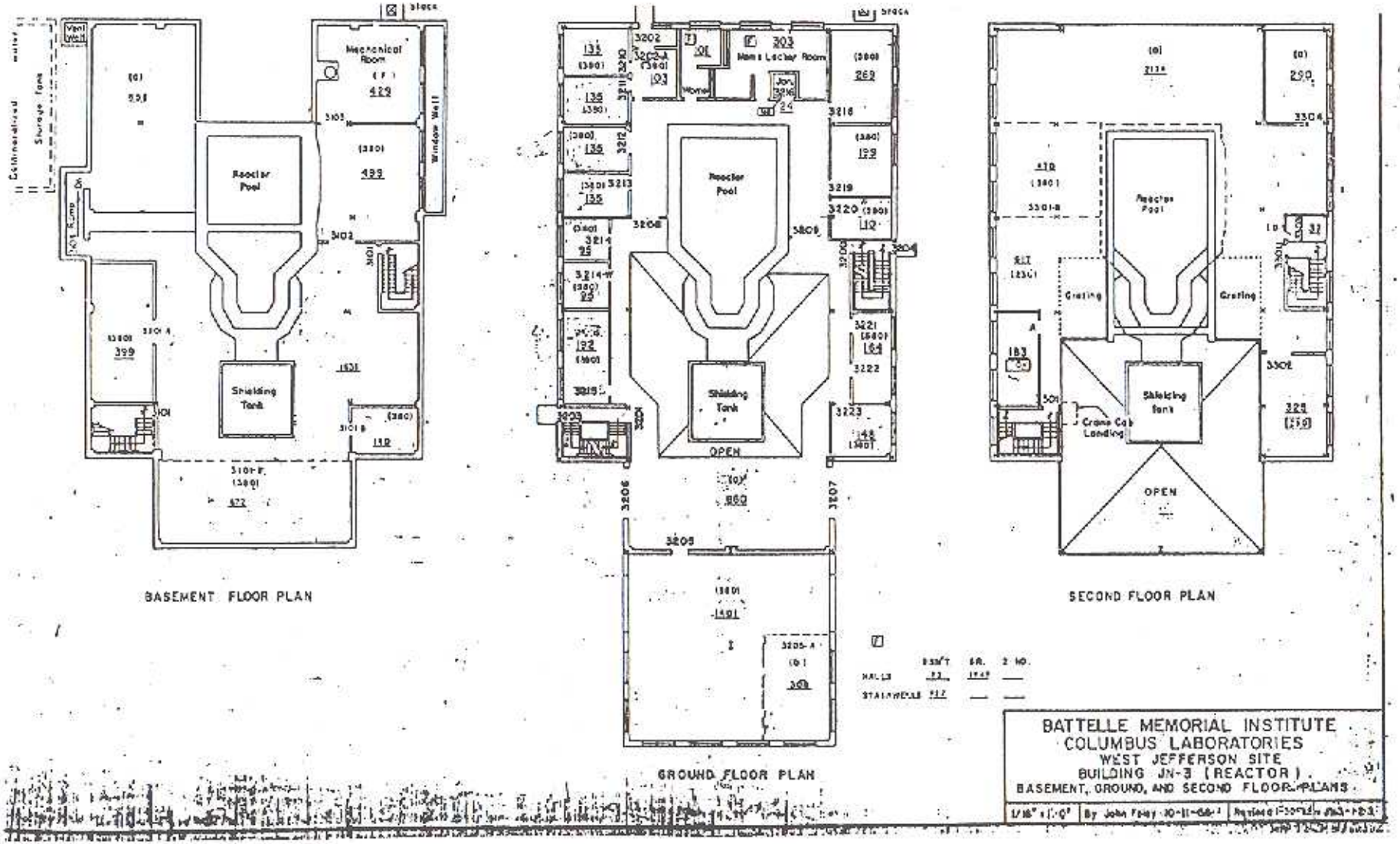




(F)	1ST	2ND.
HALLS	245	724
STAIRWELLS	421	99

BATTELLE MEMORIAL INSTITUTE
COLUMBUS LABORATORIES
WEST JEFFERSON SITE
BUILDING JN-2 (CRITICAL ASSEMBLY)
GROUND & SECOND FLOOR PLAN

1/16" = 1'-0"	By J. Phillips 10-5-55	Revised 9-27-91	JN2-1-2


Reactor Pool
Shielding Tank
Mechanical Room
Window Well
BASEMENT FLOOR PLAN
Reactor Pool
Shielding Tank
OPEN
GROUND FLOOR PLAN
Reactor Pool
Shielding Tank
Grating
Grating
Crane Cab Landing
OPEN
SECOND FLOOR PLAN
BATTELLE MEMORIAL INSTITUTE
COLUMBUS LABORATORIES
WEST JEFFERSON SITE
BUILDING JN-3 (REACTOR).
BASEMENT, GROUND, AND SECOND FLOOR PLANS.

FOR OFFICIAL USE ONLY

Premise No._____
Source No._____

APPENDIX A, PROCESS

PROCESS DATA

1. Name of process Laboratory - See Notes

2. End product of this process See Notes

3. Primary process equipment Chemical Ventilation Hood

   Your identification Microprobe Rm. Chemical Hood Year Installed 1971

4. Manufacturer Kewaunee Scientific Make or Model NK

5. Capacity of equipment (lbs./hr): Rated see notes Max. Na

6. Method of exhaust ventilation: ☒ Stack ☐ Window fan ☐ Roof vent
   ☐ Other, describe _____

   Are there multiple exhausts? ☐ Yes ☒ No

OPERATING DATA

7. Normal operating schedule: NA hrs./day, NA days/wk., NA wks./year. See notes

8. Percent annual production (finished units) by season: See notes
   Winter____ Spring____ Summer____ Fall____

9. Hourly production rates (lbs.): Average NA - see notes Maximum NA

10. Annual production (indicate units) Na - See notes
    Projected percent annual increase in production NA

11. Type of operation: ☐ Continuous ☒ Batch See notes

12. If batch, indicate Minutes per cycle NA See notes Minutes between cycles NA

13. Materials used in process: See notes

List of Raw Materials	Principal Use	Amounts (lbs./hr.)
NA	NA	NA

14. A PROCESS FLOW DIAGRAM MUST BE INCLUDED WITH THIS APPENDIX. Show entry and exit points of all raw materials, intermediate products, by-products and finished products. Label all materials including airborne contaminants and other waste materials. Label the process equipment and control equipment.

(continued on reverse side)

Control Equipment Codes:

(A) Settling chamber	(G) Cyclonic scrubber	(M) Adsorber
(B) Cyclone	(H) Impingement scrubber	(N) Condenser
(C) Multiple cyclone	(I) Orifice scrubber	(O) Afterburner - catalytic
(D) Electrostatic precipitator	(J) Venturi scrubber	(P) Afterburner - thermal
(E) Fabric filter	(K) Plate or tray tower	(Q) Other, describe Particulate
(F) Spray chamber	(L) Packed tower	

15. Control Equipment data:

Item	Primary Collector Rough Filter	Secondary Collector Dual HEPA Filter
(a) Type (See above code	Q	Q
(b) Manufacturer	American Air Filter	American Air Filter
(c) Model No.	147-002-863	105-883025-507
(d) Year installed	1971	1971
(e) Your identification	None	None
(f) Pollutant Controlled	Particulate/Radionuclides	
(g) Controlled pollutant emission rate (if known)	NK	NK
(h) Pressure drop	9" = see notes	5" - see notes
(i) Design efficiency	30-35%	99.97%
(j) Operating efficiency	NK	99.95%

STACK DATA

16. Your stack identification Microprobe Room Hood Vent

17. Are other sources vented to this stack: ☐ Yes ☒ No
If, yes, identify sources _____

18. Type: ☒ Round, top inside diameter dimension 12"
☐ Rectangular, top inside dimensions (L) _____ x(W) _____

19. Height: Above roof 2.5 ft., above ground 30.75 ft.

20. Exit gas: Temp. 70 °F, Volume 1413 ACFM, Velocity 1800 ft./min.

21. Continuous monitoring equipment: ☐ Yes ☒ No
If yes, indicate: Type _____, Manufacturer _____
Make or Model _____, Pollutant(s) monitored _____

22. Emission date: Emissions from this source have been determined and such data is included with this appendix: NK

If yes, check method: ☐ Stack Test ☐ Emission factor ☐ Material Balance

Completed by Eddie R. Swindall, Date March 15, 1996

EPA-3100

NOTES ON APPENDIX A, PROCESS PERMIT TO INSTALL APPLICATION FOR BATTELLE - WEST JEFFERSON FACILITY JN-1 MICROPROBE ROOM

Item #	Comment
1	This room was formerly an operational laboratory. It is currently used for equipment and materials storage.
2	This question is not applicable. There is no end product.
5	This question is not applicable for a chemical ventilation hood. The hood does not have a pounds/hour capacity.
7	This hood is only operated as needed for mixing chemicals or testing samples. It is rarely operated and is used only a few times per year for a few minutes at a time.
8-10	There is no material produced by the hoods, therefore questions 8-10 do not apply.
11-12	As previously mentioned, the hood is operated on an as-needed basis for a few minutes every year.
13	There are no materials produced under the hoods; however, the hood is utilized occasionally (once or twice per year) for the mixing of cleaning solution.
14	See attached diagram.
15(h)	The pressure drop across the rough and first HEPA filter is monitored and filters are changed if the pressure increases above nine inches. The pressure drop across the second HEPA filter is also monitored and the filter is changed if the pressure increases above five inches. The filters are aligned in series.

20	Velocity and volume were measured during the most recent DOP test.
21	There is no continuous air monitor of this vent; however, the filters are subjected to an annual DOP test. In addition to the air monitor, the pressure gauges for the filters are monitored daily and also checked each time the unit is put into use.
22	Actual stack emissions are not known as there are no emission tests conducted on the effluent from the stack. Area monitors are used to determine radionuclide activity at the property boundary. These results are compiled and summarized annually in the *Site Environmental Report* (SER). A copy of the latest SER is enclosed.

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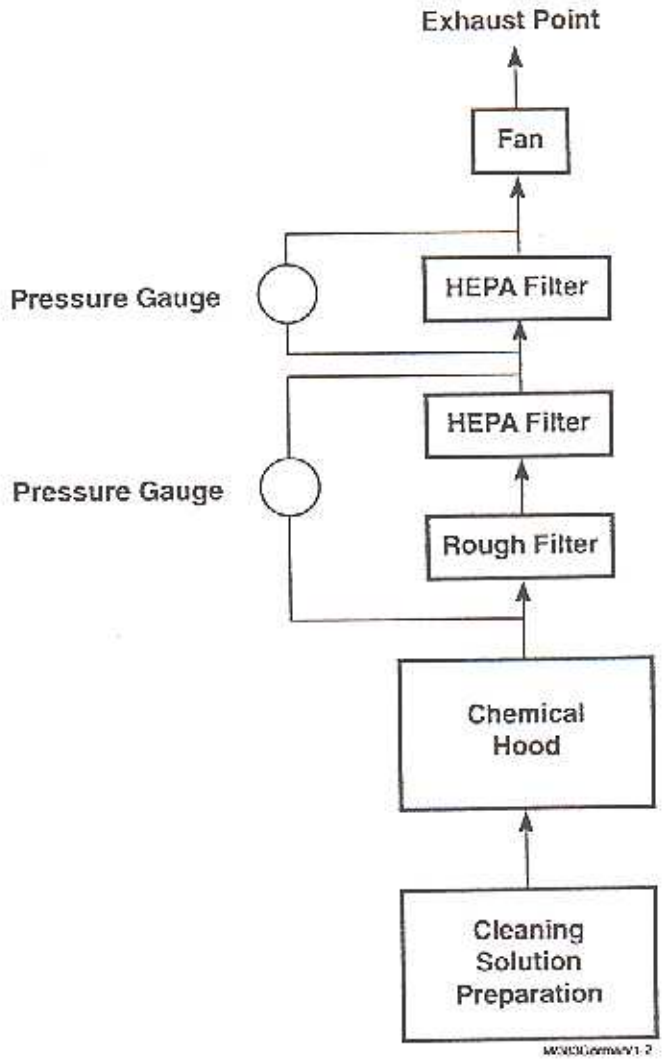
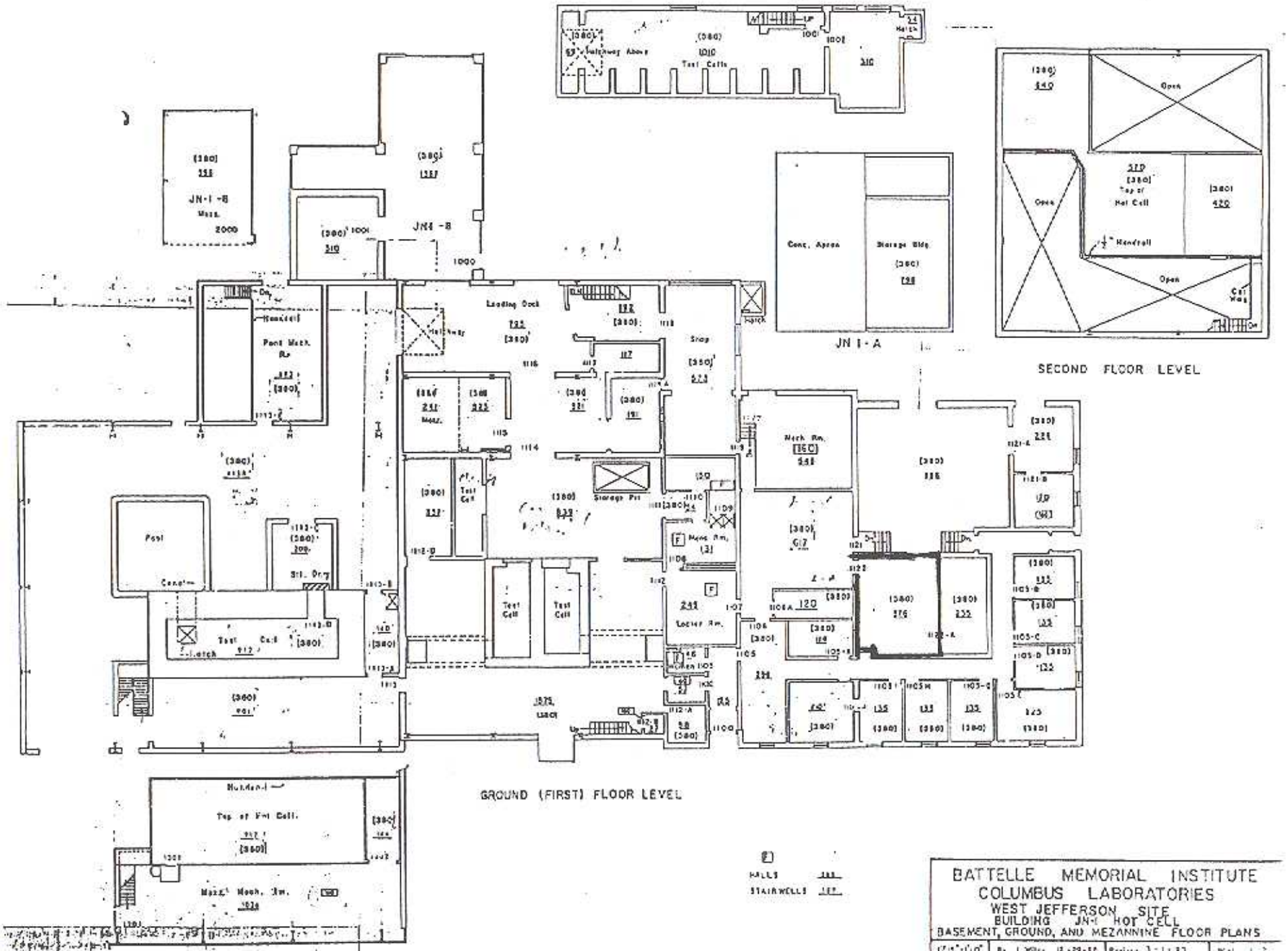
JN-1 Microprobe Room Chemical Hood -
West Jefferson Facility



Item 14. Process Flow Diagram



BATTELLE MEMORIAL INSTITUTE
COLUMBUS LABORATORIES
WEST JEFFERSON SITE
BUILDING JN-1 HOT CELL
BASEMENT, GROUND, AND MEZANNINE FLOOR PLANS

FOR OFFICIAL USE ONLY

Premise No. _____
Source No. _____

APPENDIX A, PROCESS

PROCESS DATA

1. Name of process Radiological Research

2. End product of this process Radiological Information

3. Primary process equipment Test Cell - See Notes

   Your identification High Level Test Cell Year Installed 1955

4. Manufacturer NA - See notes Make or Model NA

5. Capacity of equipment (lbs./hr): Rated see notes Max. NA

6. Method of exhaust ventilation: ☒ Stack ☐ Window fan ☐ Roof vent
   ☐ Other, describe _____

   Are there multiple exhausts? ☐ Yes ☒ No

OPERATING DATA

7. Normal operating schedule: 24 hrs./day, 7 days/wk., 52 wks./year.

8. Percent annual production (finished units) by season: See notes
   Winter ____ Spring ____ Summer ____ Fall ____

9. Hourly production rates (lbs.): Average NA- See notes Maximum NA

10. Annual production (indicate units) NA - See notes
    Projected percent annual increase in production NA

11. Type of operation: ☒ Continuous ☐ Batch

12. If batch, indicate Minutes per cycle NA Minutes between cycles NA

13. Materials used in process:

List of Raw Materials	Principal Use	Amounts (lbs./hr.)
NA	NA	NA

14. A PROCESS FLOW DIAGRAM MUST BE INCLUDED WITH THIS APPENDIX. Show entry and exit points of all raw materials, intermediate products, by-products and finished products. Label all materials including airborne contaminants and other waste materials. Label the process equipment and control equipment.

(continued on reverse side)

Control Equipment Codes:

(A) Settling chamber	(G) Cyclonic scrubber	(M) Adsorber
(B) Cyclone	(H) Impingement scrubber	(N) Condenser
(C) Multiple cyclone	(I) Orifice scrubber	(O) Afterburner - catalytic
(D) Electrostatic precipitator	(J) Venturi scrubber	(P) Afterburner - thermal
(E) Fabric filter	(K) Plate or tray tower	(Q) Other, describe
(F) Spray chamber	(L) Packed tower	Particulate Filter

15. Control Equipment data:

Item	Primary Collector Rough filter	Secondary Collector Dual HEPA Filter
(a) Type (See above code	Q	Q
(b) Manufacturer	American Air Filter	American Air Filter
(c) Model No.	147-002-863	105-883025-507
(d) Year installed	1977	1977
(e) Your identification	None	None
(f) Pollutant Controlled	Par./Radionuclides	Particulate/Radionuclides
(g) Controlled pollutant emission rate (if known)	NK	NK
(h) Pressure drop	9" see notes	5" see notes
(i) Design efficiency	30-35%	99.97%
(j) Operating efficiency	NK	99.95%

STACK DATA

16. Your stack identification High Level Cell Vent

17. Are other sources vented to this stack: ☐ Yes ☒ No
If, yes, identify sources NA

18. Type: ☒ Round, top inside diameter dimension 8"
☐ Rectangular, top inside dimensions (L) _____ x(W) _____

19. Height: Above roof 9 ft., above ground 37.25 ft.

20. Exit gas: Temp. 70 °f, Volume 802.44 ACFM, Velocity 2300 ft./min.

21. Continuous monitoring equipment: ☒ Yes ☐ No See notes
If yes, indicate: Type NA, Manufacturer Eberline
Make or Model AMS-4, Pollutant(s) monitored beta radiation

22. Emission date: Emissions from this source have been determined and such data is included with this appendix: See notes

If yes, check method: ☐ Stack Test ☐ Emission factor ☐ Material Balance

Completed by E.R. Swindall, Date March 15, 1996

EPA-3100

NOTES ON APPENDIX A, PROCESS PERMIT TO INSTALL APPLICATION FOR BATTELLE - WEST JEFFERSON FACILITY JN-1 HIGH LEVEL TEST CELL

Item #	Comment
3	There is no process which takes in this cell. The cell was utilized in the past for high level radiation research; however, it is presently out of service and awaiting decontamination and decommissioning (D&D).
4	There is no manufacturer, make or model number for this cell. It was designed and constructed by Battelle.
5	This question is not applicable as this test cell is out of service and the research which once took place cannot be quantified in pounds/hour.
6	The cell is exhausted through control equipment, then out a single stack on the roof. Ambient pressure monitoring is used to ensure that this and other cells within the building are the point of lowest pressure, thus ensuring that all potential airborne contaminants within the building are drawn into the cell and vented through control equipment prior to exhausting the building air to the atmosphere.
7	No product is being generated; however, the ventilation system operates continuously to maintain negative pressure.
8-13	As no product is being generated, annual and hourly production questions are not applicable and there are no raw materials utilized. Until the cells are decommissioned, the ventilation system and control equipment operate continuously, barring equipment malfunction.
14	See attached diagram.
15(h)	The pressure drop across the rough and first HEPA filter is monitored and filters are changed if the pressure increases above nine inches. The pressure drop across

15(h) cont. the second HEPA filter is also monitored and the filter is changed if the pressure increases above five inches. The filters are aligned in series.

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20 Volume and velocity were measured during the most recent stack

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21 A continuous air monitor is used to monitor effluent gases in the vent on the backside of the HEPA filters for radionuclides. The monitor includes an in-line volumetric sampler which operates continuously and the sample filter paper is collected weekly. The weekly sample is analyzed for total Beta and total Alpha activity. Weekly samples are composited monthly and the composite is analyzed by gamma spectrometry. Monthly composite samples are again composited, quarterly, and this composite is analyzed for Uranium, Plutonium, and Strontium-90 isotopes. The monitor also continuously measures Beta activity from the filter paper and records this value on a chart recorder. When an elevated activity level is detected, an alarm sounds locally, on the JN-1 alarm control panel, and in the West Jefferson South area guard house. This alarm will also sound if there is a malfunction of the air monitor. A separate alarm will also sound in the same locations if there is an exhaust fan malfunction.

In addition to the air monitor, the pressure gauges for the filters are checked at least daily and the HEPA filters are DOP tested annually.

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22 As previously stated, representative samples of the stack particulate emissions are continuously collected and the samples are analyzed for various radionuclides weekly, monthly, and quarterly, according to the *Site Environmental Monitoring Plan*. These results are compiled and summarized annually in the *Site Environmental Report* (SER). A copy of the latest SER is enclosed.

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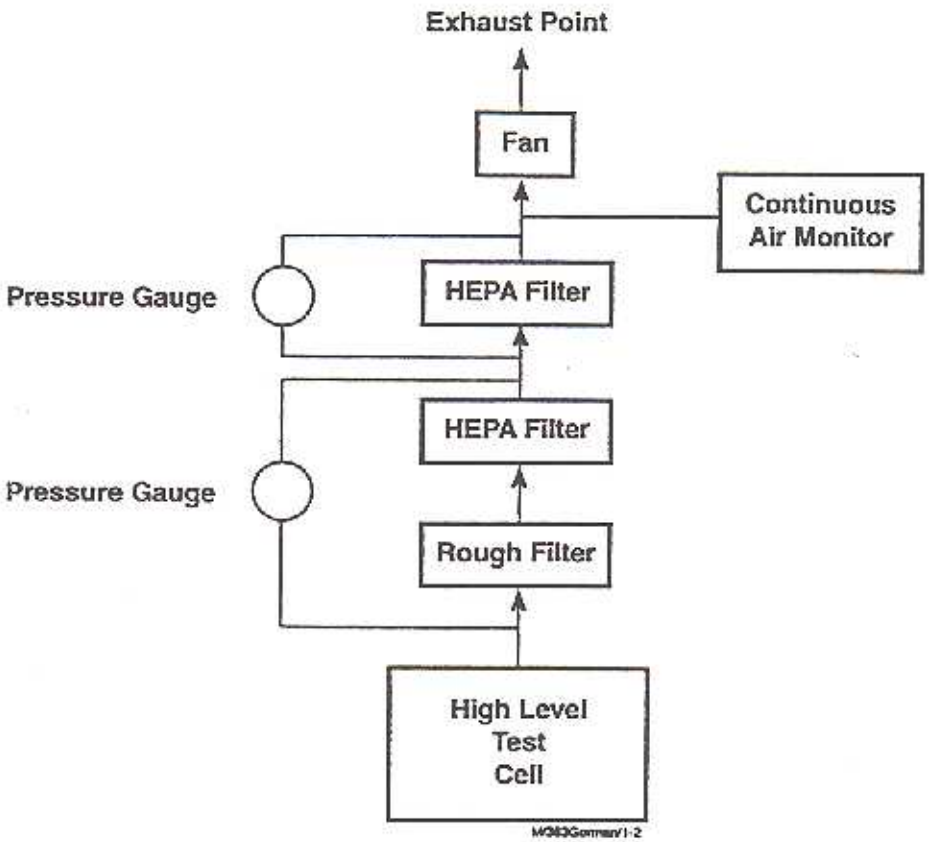
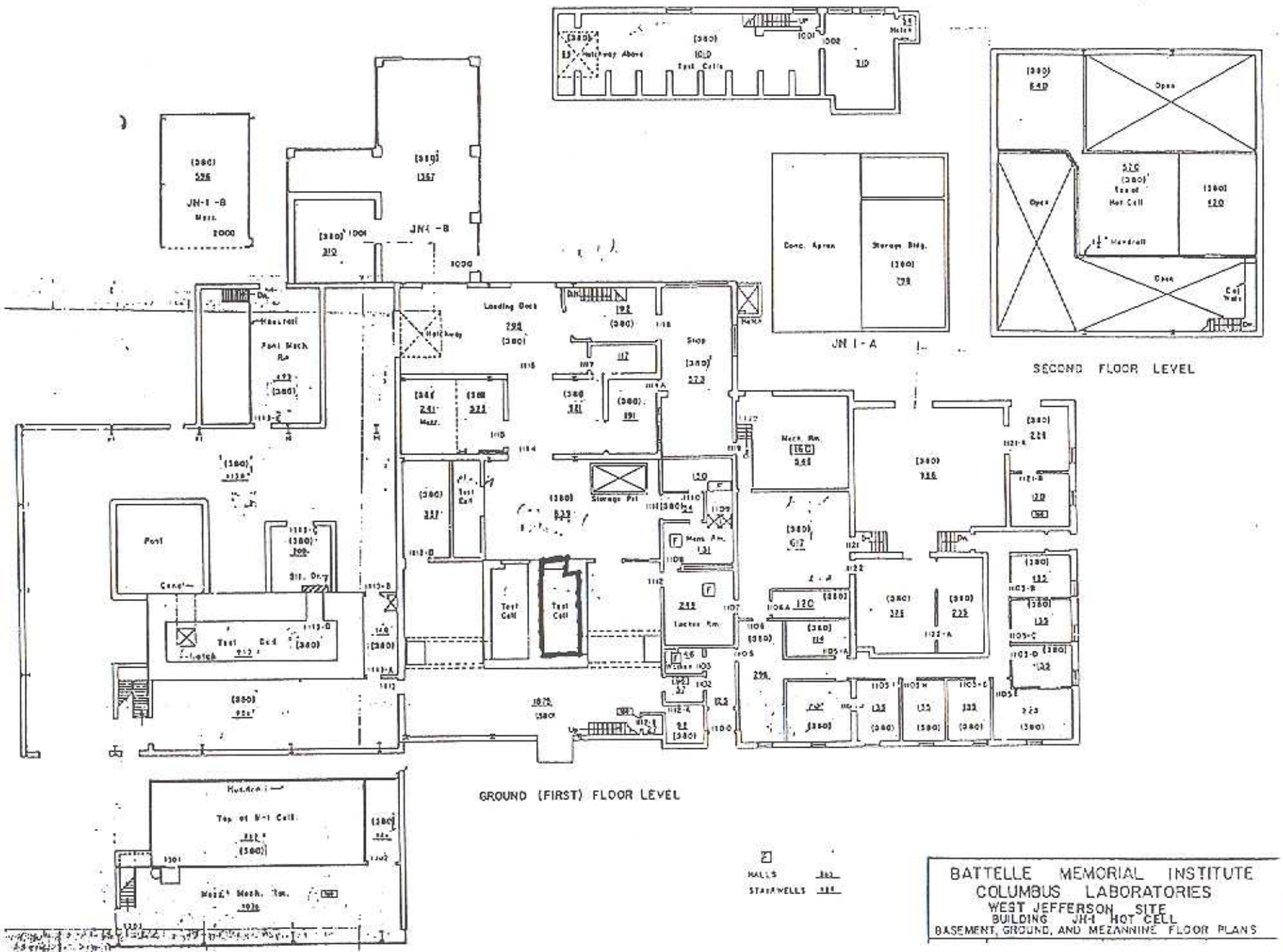
JN-1 High Level Test Cell -
West Jefferson Facility



Item 14. Process Flow Diagram



BATTELLE MEMORIAL INSTITUTE
COLUMBUS LABORATORIES
WEST JEFFERSON SITE
BUILDING JN-1 HOT CELL
BASEMENT, GROUND, AND MEZANNINE FLOOR PLANS

FOR OFFICIAL USE ONLY

Premise No. _____
Source No. _____

APPENDIX A, PROCESS

PROCESS DATA

1. Name of process Evaporation

2. End product of this process water vapor and sludge

3. Primary process equipment Evaporator

   Your identification JN-1 Evaporator Year Installed 1984

4. Manufacturer fabricated by Battelle Make or Model NA

5. Capacity of equipment (lbs./hr): Rated NK Max. NK - See notes

6. Method of exhaust ventilation: ☒ Stack ☐ Window fan ☐ Roof vent ☐ Other, describe _____

   Are there multiple exhausts? ☐ Yes ☒ No

OPERATING DATA

7. Normal operating schedule: 24 hrs./day, 7 days/wk., 52 wks./year. See notes

8. Percent annual production (finished units) by season: See notes
   Winter ____ Spring ____ Summer ____ Fall ____

9. Hourly production rates (lbs.): Average NK Maximum NK

10. Annual production (indicate units) 1994 - 1100 gallons, 1995 - 1450 gallons
    Projected percent annual increase in production none

11. Type of operation: ☐ Continuous ☒ Batch

12. If batch, indicate Minutes per cycle NA Minutes between cycles NA - See notes

13. Materials used in process:

List of Raw Materials	Principal Use	Amounts (lbs./hr.)
Laboratory waste	result	NA
water and	operation at	
controlled Area	the facility	
mop water		

14. A PROCESS FLOW DIAGRAM MUST BE INCLUDED WITH THIS APPENDIX. Show entry and exit points of all raw materials, intermediate products, by-products and finished products. Label all materials including airborne contaminants and other waste materials. Label the process equipment and control equipment.

(continued on reverse side)

Control Equipment Codes:

(A) Settling chamber	(G) Cyclonic scrubber	(M) Adsorber
(B) Cyclone	(H) Impingement scrubber	(N) Condenser
(C) Multiple cyclone	(I) Orifice scrubber	(O) Afterburner - catalytic
(D) Electrostatic precipitator	(J) Venturi scrubber	(P) Afterburner - thermal
(E) Fabric filter	(K) Plate or tray tower	(Q) Other, describe Particulate Filter
(F) Spray chamber	(L) Packed tower	

15. Control Equipment data:

Item	Primary Collector Rough	Secondary Collector Dual HEPA Filter
(a) Type (See above code	Q	Q
(b) Manufacturer	American Air Filter	American Air Filter
(c) Model No.	147-002-863	105-883025-507
(d) Year installed	1984	1984
(e) Your identification	None	None
(f) Pollutant Controlled	Particulate/	Radionuclides
(g) Controlled pollutant emission rate (if known)	NK	NK
(h) Pressure drop	9" See notes	5" See-notes
(i) Design efficiency	30-35%	99.97%
(j) Operating efficiency	NK	99.95%

STACK DATA

16. Your stack identification Evaporator Vent

17. Are other sources vented to this stack: ☐ Yes ☒ No
If, yes, identify sources NA

18. Type: ☒ Round, top inside diameter dimension 8"
☐ Rectangular, top inside dimensions (L) _____ x(W) _____

19. Height: Above roof 9 ft., above ground 37.25 ft.

20. Exit gas: Temp. 120 °f, Volume 1203.7 ACFM, Velocity 3450 ft./min.

21. Continuous monitoring equipment: ☒ Yes ☐ No
If yes, indicate: Type NA, Manufacturer Eberline
Make or Model AMS-4, Pollutant(s) monitored beta radiation

22. Emission date: Emissions from this source have been determined and such data is included with this appendix:

If yes, check method: ☐ Stack Test ☐ Emission factor ☐ Material Balance

Completed by Eddie R. Swindall, Date March 15. 1996

EPA-3100

NOTES ON APPENDIX A, PROCESS PERMIT TO INSTALL APPLICATION FOR BATTELLE - WEST JEFFERSON FACILITY JN-1 EVAPORATOR

Item #	Comment
5	The evaporator can hold 250 gallons of water at one time. The amount of water that can be evaporated in a one hour period is not known and varies depending on the amount of sludge on the bottom of the unit. The unit only operates when there is a need to evaporate waste water. Generally, 250 gallons of water can be evaporated in five to seven days.
6	The evaporator is exhausted through control equipment, then out a stack on the roof. Humidity controls are used to prevent water vapor from condensing on the control equipment (particulate filters). If necessary, the exhaust air can be ventilated into the control area subsequent to the control equipment.
7-8	When utilized, this unit operates continuously. This only on an as needed basis. The annual production will vary. A list of water transfers during 1994 and 1995 is enclosed.
9	As previously stated, hourly production rates are not known and depend on the amount of sludge accumulation on the bottom of the unit.
12	Waste water is transferred to the evaporator holding tank from which 250 gallons are pumped into the evaporator. As water evaporates additional water from the holding tank is added until the holding tank is empty. At this time the evaporator is shut down until it is needed again. A summary of transfers for 1994 and 1995 is enclosed.
14	See attached diagram.
15(h)	The pressure drop across the rough and first HEPA filter is monitored and filters are changed if the pressure increases above nine inches. The pressure drop across the second HEPA filter is also monitored and the filter is changed if the pressure

15(h) cont.	increases above five inches. The filters are aligned in series.
20	Velocity and volume are measured during DOP test.
21	A continuous air monitor is used to monitor effluent gases in the vent on the backside of the HEPA filters for radionuclides. The monitor includes an in-line volumetric sampler which operates continuously and the sample filter paper is collected weekly. The weekly sample is analyzed for total Beta and total Alpha activity. Weekly samples are composited monthly and the composite is analyzed by gamma spectrometry. Monthly composite samples are again composited, quarterly, and this composite is analyzed for Uranium, Plutonium, and Strontium-90 isotopes. The monitor also continuously measures Beta activity from the filter paper and records this value on a chart recorder. When an elevated activity level is detected, an alarm sounds locally, on the JN-1 alarm control panel, and in the West Jefferson South area guard house. This alarm will also sound if there is a malfunction of the air monitor. A separate alarm will also sound in the same locations if there is an exhaust fan malfunction. In addition to the air monitor, the pressure gauges for the filters are checked at least daily and the HEPA filters are DOP tested annually.
22	As mentioned above, representative samples of the stack particulate emissions are collected and the samples are analyzed for various radionuclides weekly, monthly, and quarterly, according to the *Site Environmental Monitoring Plan*. This data is compiled and summarized annually in the *Site Environmental Report* (SER). A copy of the latest SER is enclosed.

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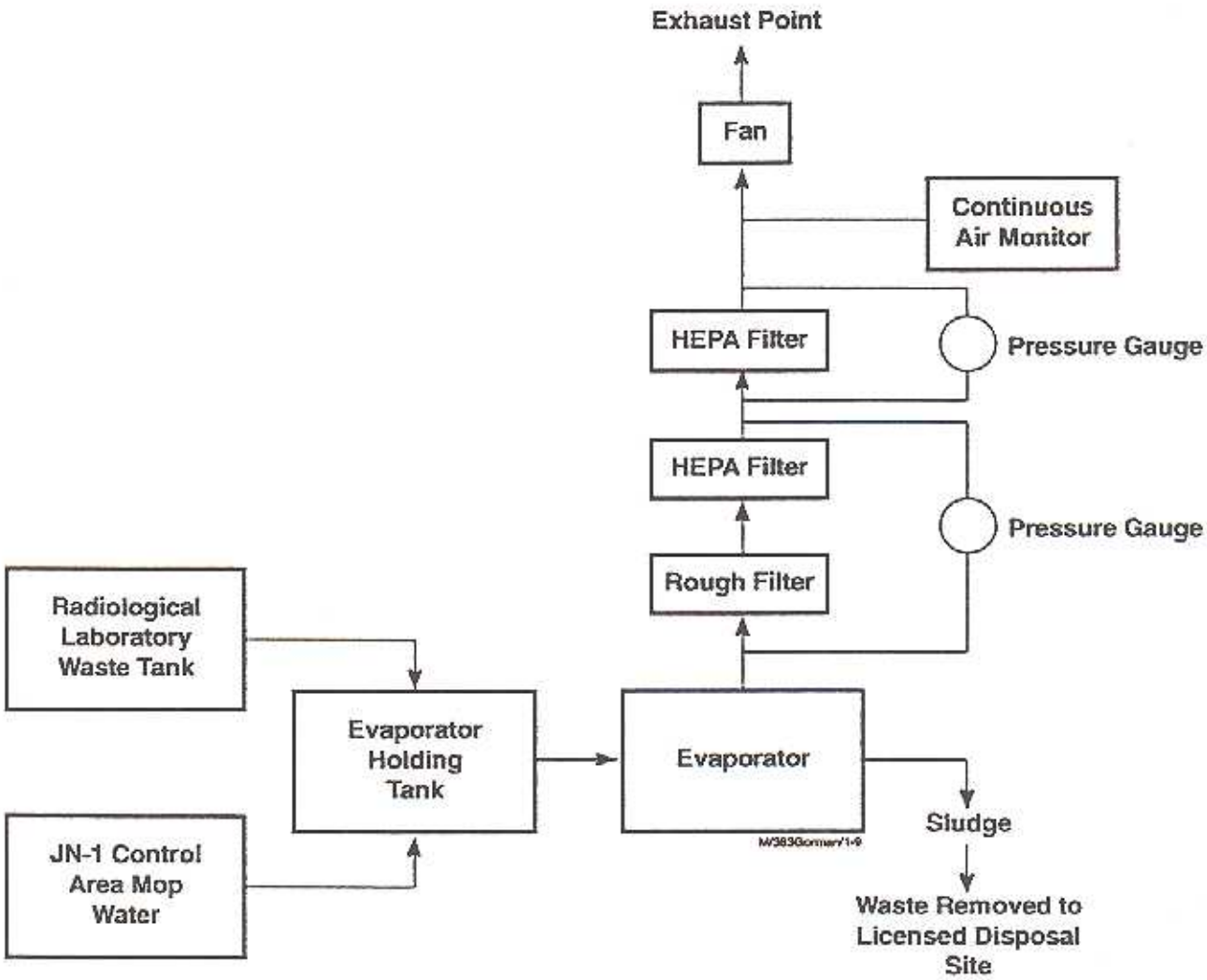
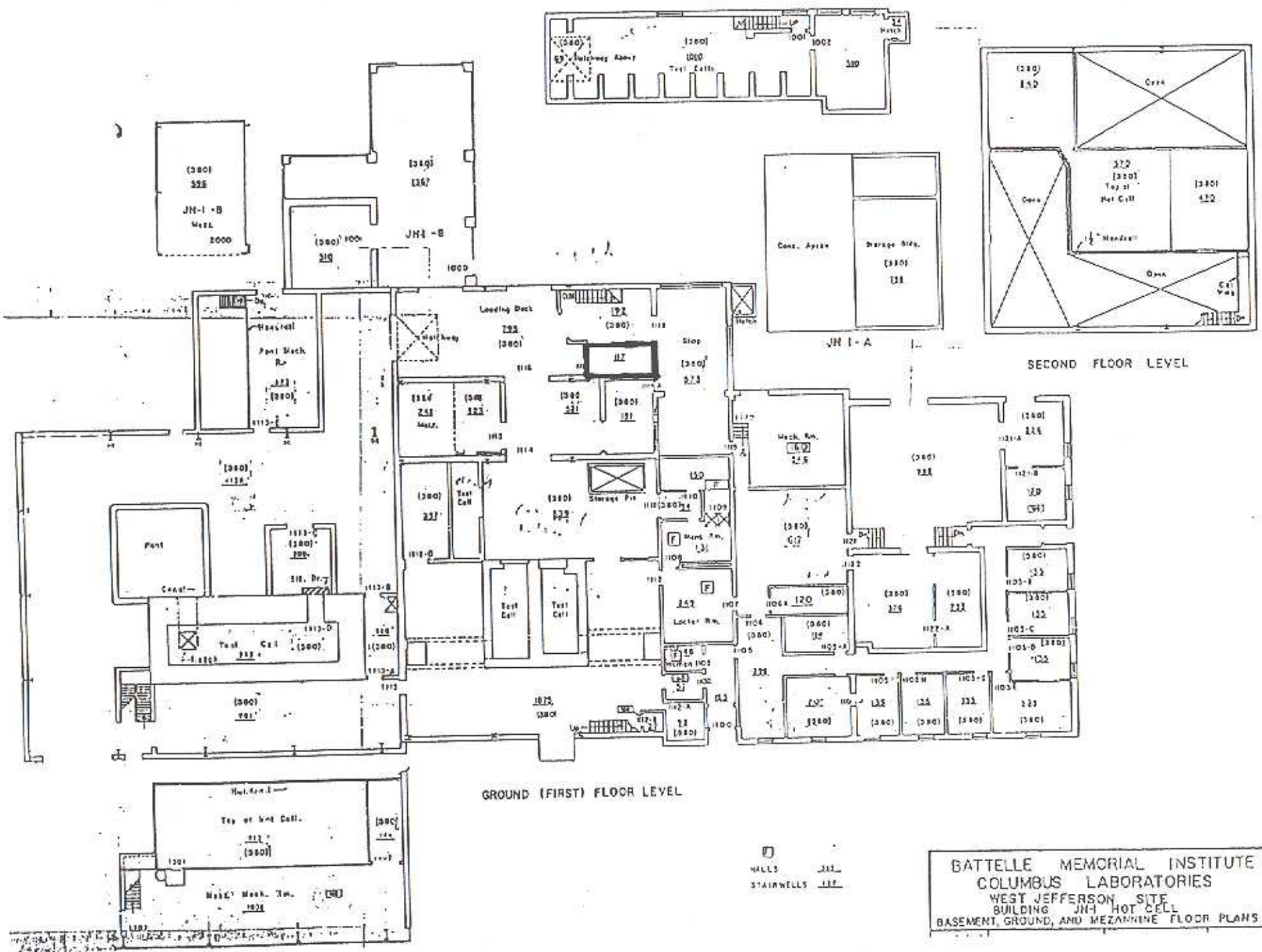
JN-1 Evaporator -
West Jefferson Facility



Item 14. Process Flow Diagram



BATTELLE MEMORIAL INSTITUTE
COLUMBUS LABORATORIES
WEST JEFFERSON SITE
BUILDING JH-1 HOT CELL
BASEMENT, GROUND, AND MEZANNINE FLOOR PLANS

CONTROL EQUIPMENT

Control Equipment Codes:

(A) Settling chamber	(G) Cyclonic scrubber	(M) Adsorber
(B) Cyclone	(H) Impingement scrubber	(N) Condenser
(C) Multiple cyclone	(I) Orifice scrubber	(O) Afterburner - catalytic
(D) Electrostatic precipitator	(J) Venturi scrubber	(P) Afterburner - thermal
(E) Fabric filter	(K) Plate or tray tower	(Q) Other, describe
(F) Spray chamber	(L) Packed tower	Particulate Filter

15. Control Equipment data:

Item	Primary Collector Rough Filter	1ST HEPA Filter	Secondary Collector 2nd HEPA Filter
(a) Type (See above code	Q	Q	Q
(b) Manufacturer	American Air	Filter	
(c) Model No.	# 140-104-863	332-528-008	105-883025-5
(d) Year installed	1972	1972	1972
(e) Your identification	None	None	None
(f) Pollutant Controlled	Particulate/	Radionuclides	
(g) Controlled pollutant emission rate (if known)	NK	NK	NK
(h) Pressure drop	9" -	See notes	5" see note
(i) Design efficiency	60%	95%	99.97%
(j) Operating efficiency	NK	NK	99.95%

STACK DATA

16. Your stack identification High Energy Cell Vent

17. Are other sources vented to this stack: ☐ Yes ☒ No
If, yes, identify sources NA

18. Type: ☐ Round, top inside diameter dimension 30"
☐ Rectangular, top inside dimensions (L) _____ x(W) _____

19. Height: Above roof 8.33 ft., above ground 74.65 ft.

20. Exit gas: Temp. 70 °F, Volume See notes ACFM, Velocity see notes ft./min.

21. Continuous monitoring equipment: ☒ Yes ☐ No
If yes, indicate: Type NA, Manufacturer Eberline
Make or Model AMS-3, Pollutant(s) monitored beta radiation

22. Emission date: Emissions from this source have been determined and such data is included with this appendix:

If yes, check method: ☐ Stack Test ☐ Emission factor ☐ Material Balance

Completed by E.R. Swindall, Date March 15, 1996

EPA-3100

NOTES ON APPENDIX A, PROCESS PERMIT TO INSTALL APPLICATION FOR BATTELLE - WEST JEFFERSON FACILITY JN-1 HIGH ENERGY CELL

Item #	Comment
3	There is no process which takes in this cell. The cell was utilized in the past for low level radiation research; however, it is presently out of service and awaiting decontamination and decommissioning (D&D).
4	There is no manufacturer, make or model number for this cell. It was designed and constructed by Battelle.
5	This question is not applicable as this test cell is out of service and the research which once took place cannot be quantified in pounds/hour.
6	The cell is exhausted through three sets of control equipment arranged in parallel. The ventilation system ductwork from the control equipment then combines to vent through a single stack on the roof. Ambient pressure monitoring is used to ensure that this and other cells within the building are the point of lowest pressure, thus ensuring that all potential airborne contaminants within the building are drawn into the cell and vented through control equipment prior to exhausting the building air to the atmosphere.
7	No product is being generated; however, the ventilation system operates continuously to maintain negative pressure.
8-13	As no product is being generated, annual and hourly production questions are not applicable and there are no raw materials utilized. Until the cells are decommissioned, the ventilation system and control equipment operate continuously, barring equipment malfunction.
14	See attached diagram.

15 There are three sets of rough and dual HEPA filters connected in parallel which ventilate this cell.

15(h) The pressure drop across the rough and first HEPA filter is monitored and filters are changed if the pressure increases above nine inches. The pressure drop across the second HEPA filter is also monitored and the filter is changed if the pressure increases above five inches. The filters in each vent are aligned in series.

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20 The volume and velocity from the combined stack servicing this cell have never been measured. The volume and velocity are measured after the second HEPA filter in each of the three individual vents during the annual test of the filters. In the most recent DOP test, volume and velocity in the north, central, and south vents were measured at 2400 ft/min and 1882 cfm, 2300 ft/min and 1805.5 cfm, and 2200 ft/min and 1727 cfm, respectively.

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21 A continuous air monitor is used to monitor effluent gases in the vent on the backside of the HEPA filters for radionuclides. The monitor includes an in-line volumetric sampler which operates continuously and the sample filter paper is collected weekly. The weekly sample is analyzed for total Beta and total Alpha activity. Weekly samples are composited monthly and the composite is analyzed by gamma spectrometry. Monthly composite samples are again composited, quarterly, and this composite is analyzed for Uranium, Plutonium, and Strontium-90 isotopes. The monitor also continuously measures Beta activity from the filter paper and records this value on a chart recorder. When an elevated activity level is detected, an alarm sounds locally, on the JN-1 alarm control panel, and in the West Jefferson South area guard house. This alarm will also sound if there is a malfunction of the air monitor. A separate alarm will also sound in the same locations if there is an exhaust fan malfunction.

In addition to the air monitor, the pressure gauges for the filters are checked at least daily and the HEPA filters are DOP tested annually.

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22 As previously stated, representative samples of the stack particulate emissions are continuously collected and the samples are analyzed for various radionuclides weekly, monthly, and quarterly, according to the *Site Environmental Monitoring Plan*. These results are compiled and summarized annually in the *Site Environmental Report* (SER). A copy of the latest SER is enclosed.

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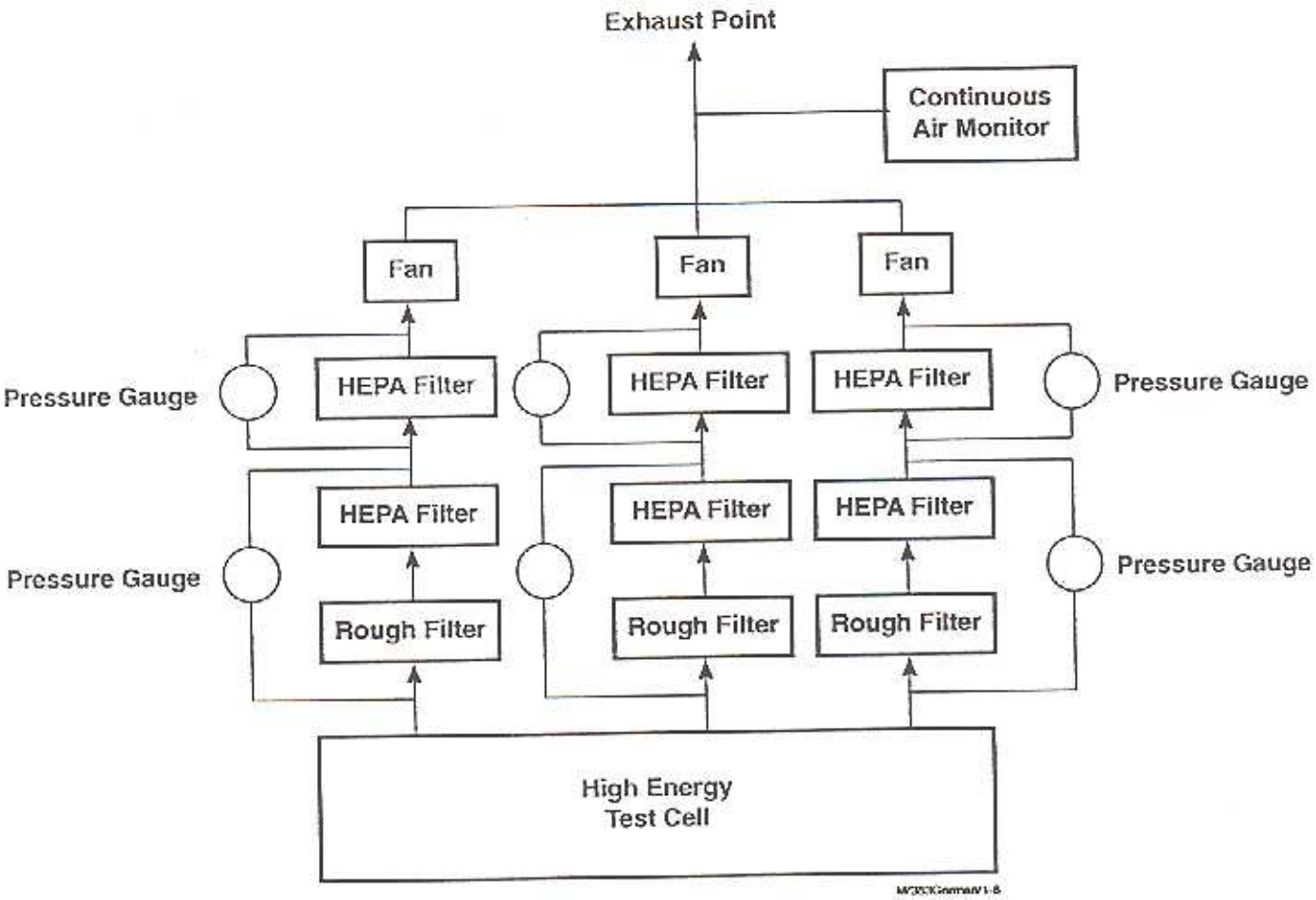
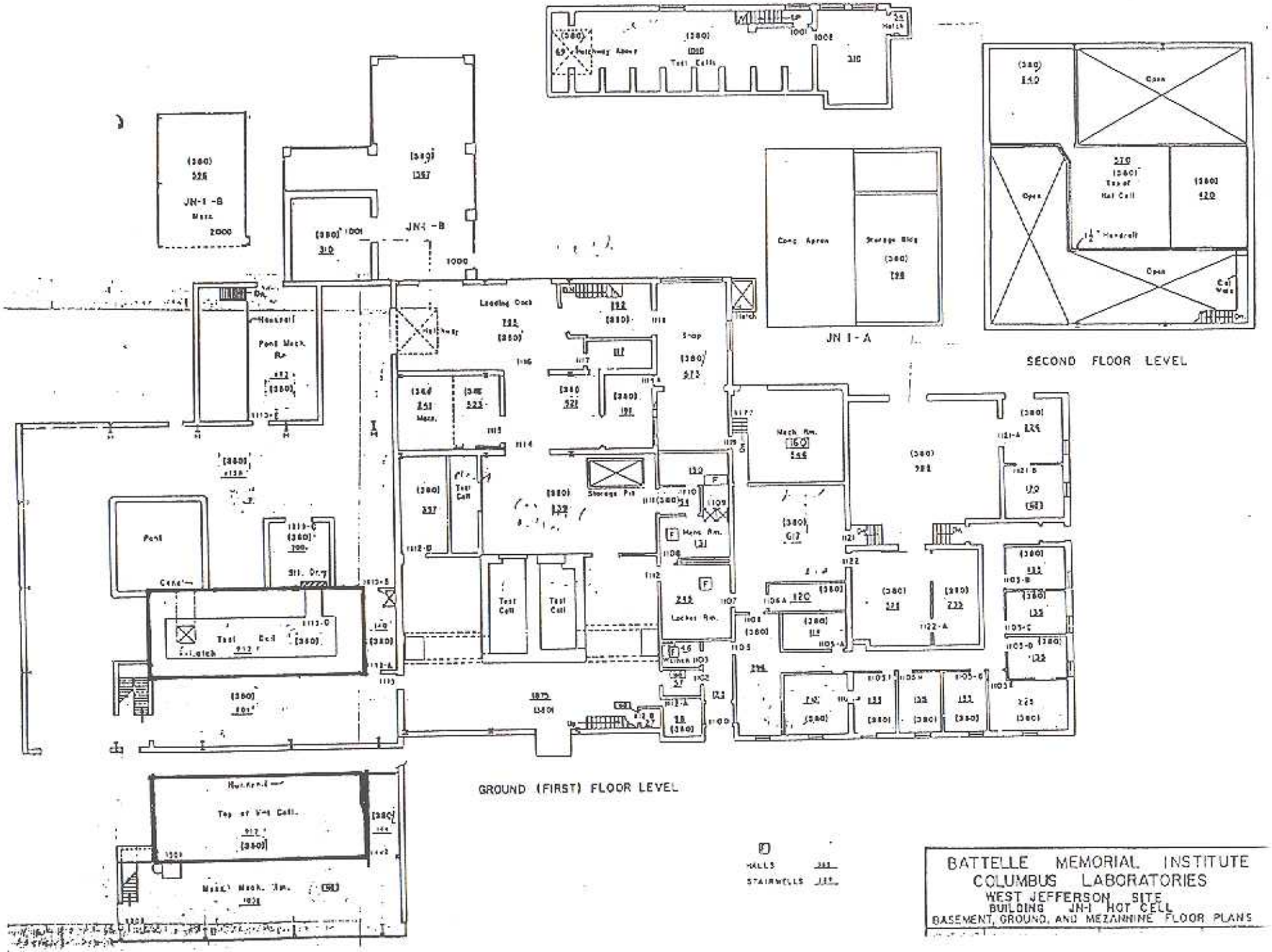
JN-1 High Energy Cell -
West Jefferson Facility



Item 14. Process Flow Diagram



BATTELLE MEMORIAL INSTITUTE
COLUMBUS LABORATORIES
WEST JEFFERSON SITE
BUILDING JN-1 HOT CELL
BASEMENT, GROUND, AND MEZANNINE FLOOR PLANS

FOR OFFICIAL USE ONLY

Premise No. _____
Source No. _____

APPENDIX A, PROCESS

PROCESS DATA

1. Name of process Radiological Research

2. End product of this process Radiological Information

3. Primary process equipment Test Cell - See notes

   Your identification Alpha/ Gamma Cells Year Installed 1977

4. Manufacturer NA - See notes Make or Model NA

5. Capacity of equipment (lbs./hr): Rated See notes Max. NA

6. Method of exhaust ventilation: ☒ Stack ☐ Window fan ☐ Roof vent
   ☐ Other, describe _____

   Are there multiple exhausts? ☐ Yes ☒ No

OPERATING DATA

7. Normal operating schedule: 24 hrs./day, 7 days/wk., 52 wks./year. See notes

8. Percent annual production (finished units) by season: See notes
   Winter ____ Spring ____ Summer ____ Fall ____

9. Hourly production rates (lbs.): Average NA Maximum NA-See notes

10. Annual production (indicate units) NA - See notes
    Projected percent annual increase in production NA

11. Type of operation: ☒ Continuous ☐ Batch See notes

12. If batch, indicate Minutes per cycle NA Minutes between cycles NA

13. Materials used in process: See notes

List of Raw Materials	Principal Use	Amounts (lbs./hr.)
NA	NA	NA

14. A PROCESS FLOW DIAGRAM MUST BE INCLUDED WITH THIS APPENDIX. Show entry and exit points of all raw materials, intermediate products, by-products and finished products. Label all materials including airborne contaminants and other waste materials. Label the process equipment and control equipment.

(continued on reverse side)

Control Equipment Codes:

(A) Settling chamber	(G) Cyclonic scrubber	(M) Adsorber
(B) Cyclone	(H) Impingement scrubber	(N) Condenser
(C) Multiple cyclone	(I) Orifice scrubber	(O) Afterburner - catalytic
(D) Electrostatic precipitator	(J) Venturi scrubber	(P) Afterburner - thermal
(E) Fabric filter	(K) Plate or tray tower	(Q) Other, describe Particulate Filter
(F) Spray chamber	(L) Packed tower	

15. Control Equipment data:

Item	Primary Collector Rough Filter	Secondary Collector Dual HEPA Filter
(a) Type (See above code	Q	Q
(b) Manufacturer	American Air Filter	American Air Filter
(c) Model No.	147-002-863	105-883025-507
(d) Year installed	1077	1977
(e) Your identification	None	None
(f) Pollutant Controlled	Particulate/Radionuclides	
(g) Controlled pollutant emission rate (if known)	NK	NK
(h) Pressure drop	9" See notes	5" See notes
(i) Design efficiency	30-35%	99.97%
(j) Operating efficiency	NK	99.95%

STACK DATA

16. Your stack identification Alpha/Gamma Cell Vent

17. Are other sources vented to this stack: ☐ Yes ☒ No
If, yes, identify sources NA

18. Type: ☒ Round, top inside diameter dimension 8"
☐ Rectangular, top inside dimensions (L) ____ x(W) ____

19. Height: Above roof 9 ft., above ground 37.25 ft.

20. Exit gas: Temp. 70 °F, Volume 872 ACFM, Velocity 2500 ft./min.

21. Continuous monitoring equipment: ☒ Yes ☐ No
If yes, indicate: Type NA, Manufacturer Eberline
Make or Model AMS-4, Pollutant(s) monitored beta radiation

22. Emission date: Emissions from this source have been determined and such data is included with this appendix: See notes

If yes, check method: ☒ Stack Test ☐ Emission factor ☐ Material Balance

Completed by Eddie R. Swindall, Date March 15. 1966

EPA-3100

NOTES ON APPENDIX A, PROCESS
PERMIT TO INSTALL APPLICATION FOR
BATTELLE - WEST JEFFERSON FACILITY
JN-1 ALPHA/GAMMA CELLS

Item #	Comment
3	There is no process currently taking place. The cells were utilized in the past for radiological research; however, are presently out of service and awaiting decontamination and decommissioning (D&D).
4	There is no manufacturer, make or model number. The cells were designed and constructed by Battelle.
5	This question is not applicable as the cells are out of service and the research that once took place here cannot be quantified in pounds/hour.
6	The unit is exhausted through control equipment, then out a stack on the roof. Ambient pressure monitoring is used to ensure that this and other cells within the building are the point of lowest pressure, thus ensuring that all potential airborne contaminants within the building are drawn into the cells and vented through control equipment for capture prior to exhausting the building air to the atmosphere.
7	No product is being generated; however, the ventilation system operates continuously in order to maintain negative pressure.
8-13	As no product is being generated, annual and hourly production questions are not applicable and there are no raw materials utilized. Until the cells are decommissioned, the ventilation system and control equipment operate continuously, barring equipment malfunction.
14	See attached diagram.
15(h)	The pressure drop across the rough and first HEPA filter is monitored and filters

15(h) cont. are changed if the pressure increases above nine inches. The pressure drop across the second HEPA filter is also monitored and the filter is changed if the pressure increases above five inches. The filters are aligned in series.

---

20 Velocity and volume were measured during the most recent DOP test.

---

21 A continuous air monitor is used to monitor effluent gases in the vent on the backside of the HEPA filters for radionuclides. The monitor includes an in-line volumetric sampler which operates continuously and the sample filter paper is collected weekly. The weekly sample is analyzed for total Beta and total Alpha activity. Weekly samples are composited monthly and the composite is analyzed by gamma spectrometry. Monthly composite samples are again composited, quarterly, and this composite is analyzed for Uranium, Plutonium, and Strontium-90 isotopes. The monitor also continuously measures Beta activity from the filter paper and records this value on a chart recorder. When an elevated activity level is detected, an alarm sounds locally, on the JN-1 alarm control panel, and in the West Jefferson South area guard house. This alarm will also sound if there is a malfunction of the air monitor. A separate alarm will also sound in the same locations if there is an exhaust fan malfunction.

In addition to the air monitor, the pressure gauges for the filters are checked at least daily and the HEPA filters are DOP tested annually.

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22 As previously stated, representative samples of the stack particulate emissions are continuously collected and the samples are analyzed for various radionuclides weekly, monthly, and quarterly, according to the *Site Environmental Monitoring Plan*. These results are compiled and summarized annually in the *Site Environmental Report* (SER). A copy of the latest SER is enclosed.

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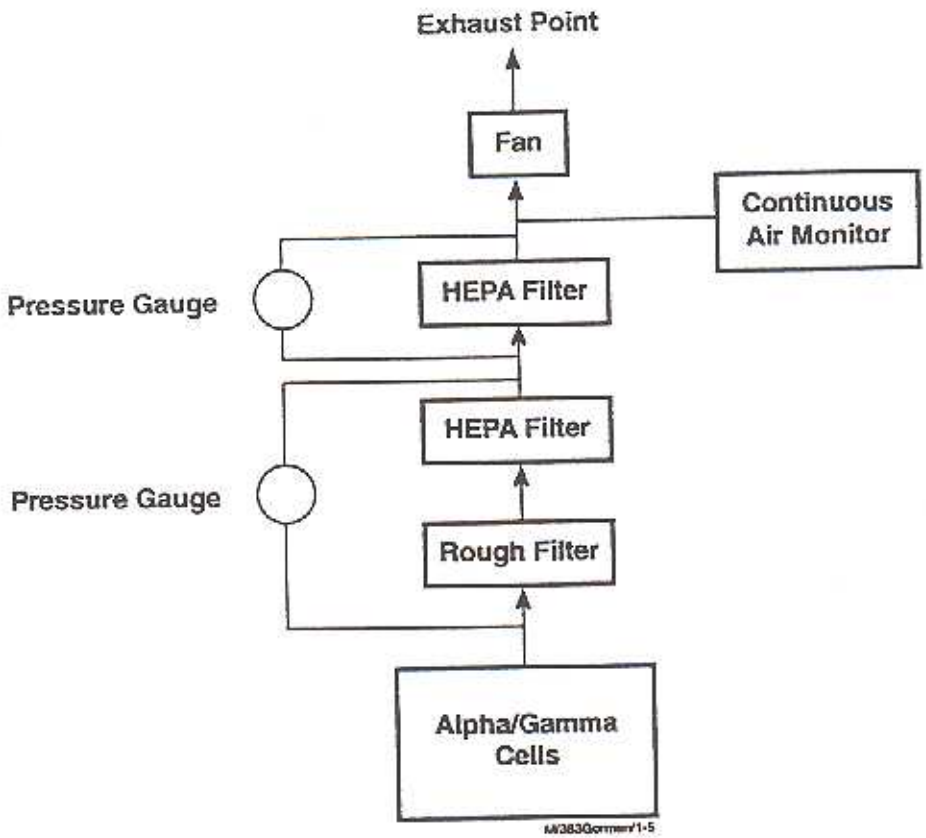
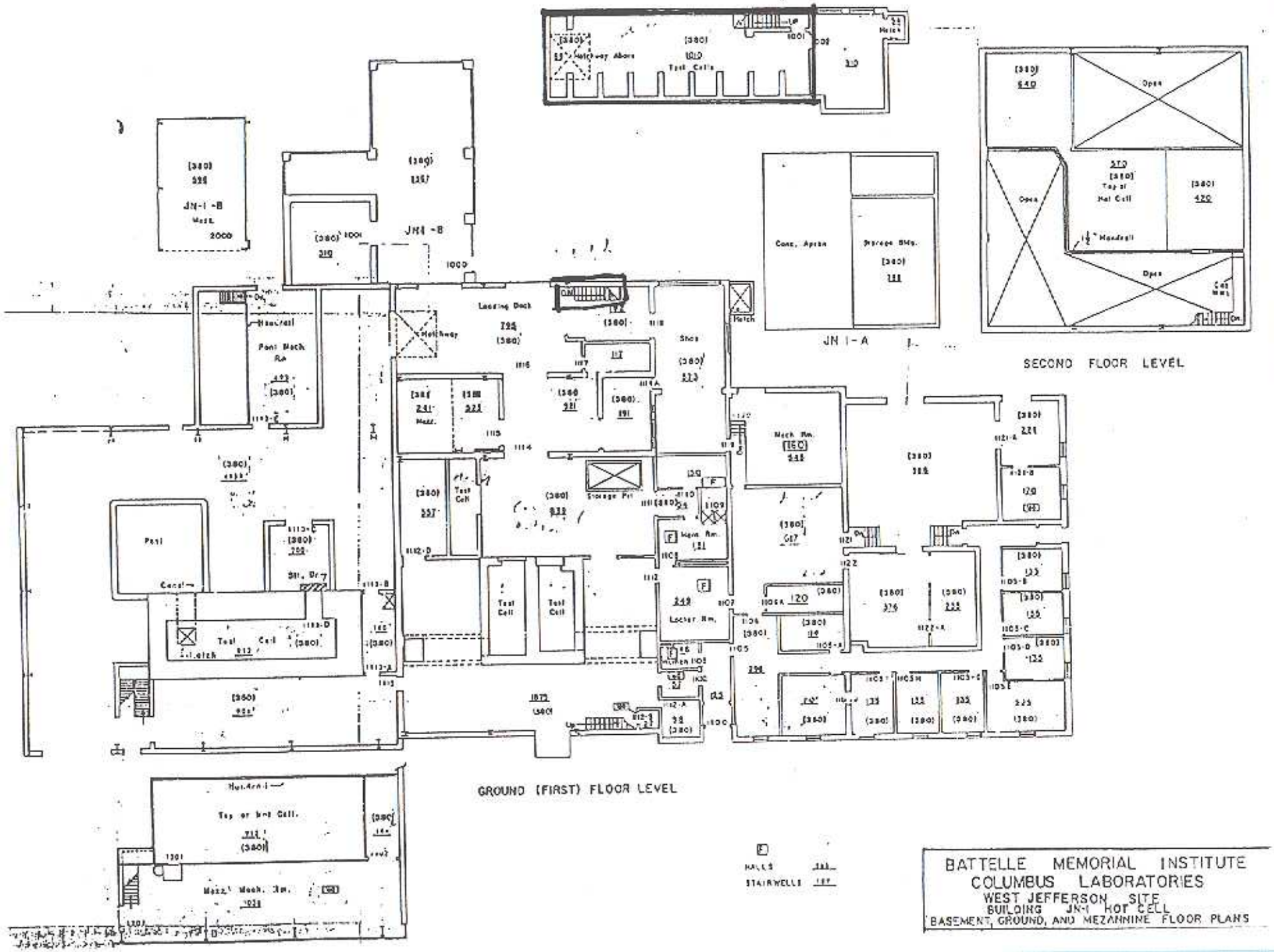
JN-1 Alpha/Gamma Test Cells -
West Jefferson Facility



Item 14. Process Flow Diagram



BATTELLE MEMORIAL INSTITUTE
COLUMBUS LABORATORIES
WEST JEFFERSON SITE
BUILDING JN-1 HOT CELL
BASEMENT, GROUND, AND MEZANNINE FLOOR PLANS

FOR OFFICIAL USE ONLY

Premise No._____
Source No._____

APPENDIX A, PROCESS

PROCESS DATA

1. Name of process Radiological Research

2. End product of this process Radiological Information

3. Primary process equipment Test Cell - See notes

   Your identification Low Level Year Installed 1955

4. Manufacturer NA - See notes Make or Model NA

5. Capacity of equipment (lbs./hr): Rated NA Max. NA - See notes

6. Method of exhaust ventilation: ☒ Stack ☐ Window fan ☐ Roof vent ☐ Other, describe_____

   Are there multiple exhausts? ☐ Yes ☒ No

OPERATING DATA

7. Normal operating schedule: 24 hrs./day, 7 days/wk., 52 wks./year. See notes

8. Percent annual production (finished units) by season: See notes
   Winter____Spring____Summer____Fall____

9. Hourly production rates (lbs.): Average NA Maximum NA - See notes

10. Annual production (indicate units) NA - See notes
    Projected percent annual increase in production NA

11. Type of operation: ☒ Continuous ☐ Batch

12. If batch, indicate Minutes per cycle NA Minutes between cycles NA

13. Materials used in process: See notes

List of Raw Materials	Principal Use	Amounts (lbs./hr.)
NA	NA	NA

14. A PROCESS FLOW DIAGRAM MUST BE INCLUDED WITH THIS APPENDIX. Show entry and exit points of all raw materials, intermediate products, by-products and finished products. Label all materials including airborne contaminants and other waste materials. Label the process equipment and control equipment.

(continued on reverse side)

Control Equipment Codes:

(A) Settling chamber	(G) Cyclonic scrubber	(M) Adsorber
(B) Cyclone	(H) Impingement scrubber	(N) Condenser
(C) Multiple cyclone	(I) Orifice scrubber	(O) Afterburner - catalytic
(D) Electrostatic precipitator	(J) Venturi scrubber	(P) Afterburner - thermal
(E) Fabric filter	(K) Plate or tray tower	(Q) Other, describe
(F) Spray chamber	(L) Packed tower	Particulate Filter

15. Control Equipment data:

Item	Primary Collector	Secondary Collector
	Rough Filter	Dual HEPA Filter
(a) Type (See above code	Q	Q
(b) Manufacturer	American Air Filter	American Air Filter
(c) Model No.	147-002-863	195-393025-507
(d) Year installed	1977	1977
(e) Your identification	None	None
(f) Pollutant Controlled	Particulate/radionuclides	
(g) Controlled pollutant emission rate (if known)	NK	NK
(h) Pressure drop	9" - See notes	5" - See notes
(i) Design efficiency	30-35%	99.97%
(j) Operating efficiency	NK	99.95%

STACK DATA

16. Your stack identification Low Level Cell Vent

17. Are other sources vented to this stack: ☐ Yes ☒ No
If, yes, identify sources NA

18. Type: ☒ Round, top inside diameter dimension 8"
☐ Rectangular, top inside dimensions (L) _____ x(W) _____

19. Height: Above roof 9 ft., above ground 37.25 ft.

20. Exit gas: Temp. 70 °f, Volume 907.57 ACFM, Velocity 2600 ft./min.

21. Continuous monitoring equipment: ☒ Yes ☐ No
If yes, indicate: Type NA, Manufacturer Eberline
Make or Model AMS-4, Pollutant(s) monitored Beta radiation

22. Emission date: Emissions from this source have been determined and such data is included with this appendix: See notes

If yes, check method: ☐ Stack Test ☐ Emission factor ☐ Material Balance

Completed by Eddie R. Swindall, Date March 15, 1996

EPA-3100

NOTES ON APPENDIX A, PROCESS PERMIT TO INSTALL APPLICATION FOR BATTELLE - WEST JEFFERSON FACILITY JN-1 LOW LEVEL TEST CELL

Item #	Comment
3	There is no process which takes in this cell. The cell was utilized in the past for radiological research, however, it is presently out of service and awaiting decontamination and decommissioning (D&D).
4	There is no manufacturer, make or model number for this cell. It was designed and constructed by Battelle.
5	This question is not applicable as this test cell is out of service and the research which once took place cannot be quantified in pounds/hour.
6	The cell is exhausted through control equipment, then out a stack on the roof Ambient pressure monitoring is used to ensure that this and other cells within the building are the point of lowest pressure, thus ensuring that all potential airborne contaminants within the building are drawn into the cell and vented through control equipment prior to exhausting the building air to the atmosphere..
7	No product is being generated; however, the ventilation system operates continuously to maintain negative pressure.
8-13	As no product is being generated, annual and hourly production questions are not applicable and there are no raw materials utilized. Until the cells are decommissioned, the ventilation system and control equipment operate continuously, barring equipment malfunction.
14	See attached diagram.
15(h)	The pressure drop across the rough and first HEPA filter is monitored and filters are changed if the pressure increases above nine inches. The pressure drop across

the second HEPA filter is also monitored and the filter is changed if the pressure increases above five inches. The filters are aligned in series.

---

20 Volume and velocity were measured during the most recent DOP test.

---

21 A continuous air monitor is used to monitor effluent gases in the vent on the backside of the HEPA filters for radionuclides. The monitor includes an in-line volumetric sampler which operates continuously and the sample filter paper is collected weekly. The weekly sample is analyzed for total Beta and total Alpha activity. Weekly samples are composited monthly and the composite is analyzed by gamma spectrometry. Monthly composite samples are again composited, quarterly, and this composite is analyzed for Uranium, Plutonium, and Strontium-90 isotopes. The monitor also continuously measures Beta activity from the filter paper and records this value on a chart recorder. When an elevated activity level is detected, an alarm sounds locally, on the JN-1 alarm control panel, and in the West Jefferson South area guard house. This alarm will also sound if there is a malfunction of the air monitor. A separate alarm will also sound in the same locations if there is an exhaust fan malfunction.

In addition to the air monitor, the pressure gauges for the filters are checked at least daily and the HEPA filters are DOP tested annually.

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22 As previously stated, representative samples of the stack particulate emissions are continuously collected and the samples are analyzed for various radionuclides weekly, monthly, and quarterly, according to the *Site Environmental Monitoring Plan*. These results are compiled and summarized annually in the *Site Environmental Report* (SER). A copy of the latest SER is enclosed.

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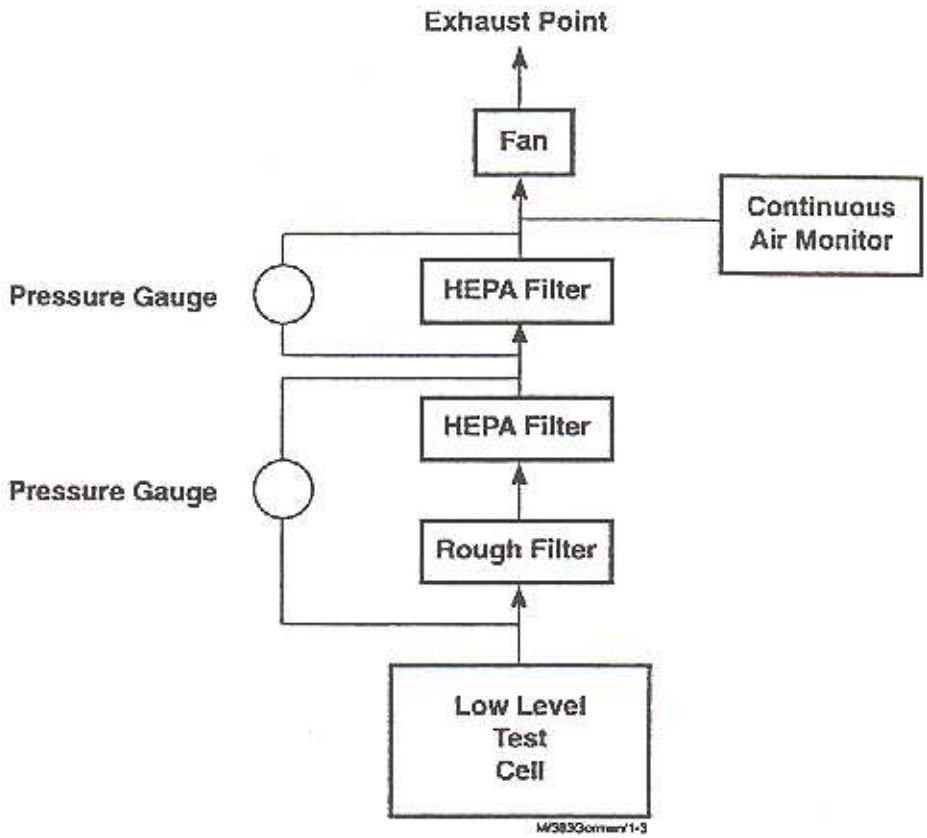
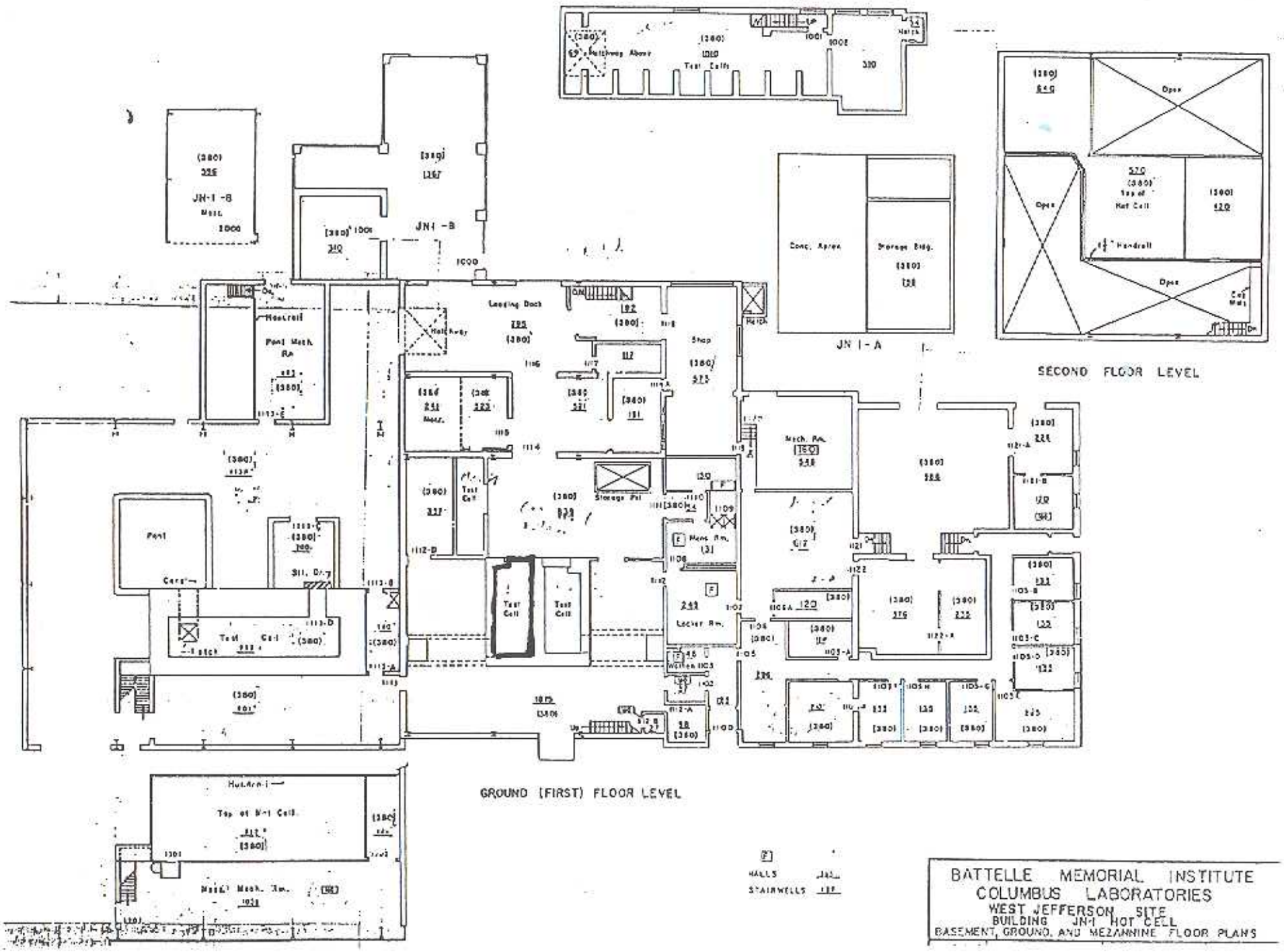
JN-1 Low Level Test Cell -
West Jefferson Facility



Item 14. Process Flow Diagram



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WEST JEFFERSON SITE
BUILDING JN-1 HOT CELL
BASEMENT, GROUND, AND MEZZANINE FLOOR PLANS

FOR OFFICIAL USE ONLY

Premise No. _____
Source No. _____

APPENDIX A, PROCESS

PROCESS DATA

1. Name of process Radiological Research

2. End product of this process Radiological Information

3. Primary process equipment Test Cell - See notes

   Your identification Mechanical Test Cell Year Installed 1955

4. Manufacturer NA - See notes Make or Model NA

5. Capacity of equipment (lbs./hr): Rated NA Max. NA - See notes

6. Method of exhaust ventilation: ☒ Stack ☐ Window fan ☐ Roof vent
   ☐ Other, describe _____
   Are there multiple exhausts? ☐ Yes ☒ No

OPERATING DATA

7. Normal operating schedule: 24 hrs./day, 7 days/wk., 52 wks./year.

8. Percent annual production (finished units) by season: See notes
   Winter ____ Spring ____ Summer ____ Fall ____

9. Hourly production rates (lbs.): Average NA Maximum NA - See notes

10. Annual production (indicate units) NA - See notes
    Projected percent annual increase in production NA

11. Type of operation: ☒ Continuous ☐ Batch

12. If batch, indicate Minutes per cycle NA Minutes between cycles NA

13. Materials used in process: See notes

List of Raw Materials	Principal Use	Amounts (lbs./hr.)
NA	NA	NA

14. A PROCESS FLOW DIAGRAM MUST BE INCLUDED WITH THIS APPENDIX. Show entry and exit points of all raw materials, intermediate products, by-products and finished products. Label all materials including airborne contaminants and other waste materials. Label the process equipment and control equipment.

(continued on reverse side)

Control Equipment Codes:

(A) Settling chamber	(G) Cyclonic scrubber	(M) Adsorber
(B) Cyclone	(H) Impingement scrubber	(N) Condenser
(C) Multiple cyclone	(I) Orifice scrubber	(O) Afterburner - catalytic
(D) Electrostatic precipitator	(J) Venturi scrubber	(P) Afterburner - thermal
(E) Fabric filter	(K) Plate or tray tower	(Q) Other, describe Particulate Filter
(F) Spray chamber	(L) Packed tower	

15. Control Equipment data:

Item	Primary Collector Rough Filter	Secondary Collector Dual HEPA Filters
(a) Type (See above code	Q	Q
(b) Manufacturer	American Air Filter	American Air Filter
(c) Model No.	147-002-863	105-883025-507
(d) Year installed	1977	1977
(e) Your identification	None	None
(f) Pollutant Controlled	Particulate Radionuclides	
(g) Controlled pollutant emission rate (if known)	NK	NK
(h) Pressure drop	9" See notes	5" See notes
(i) Design efficiency	30-35%	99.97%
(j) Operating efficiency	NK	99.95%

STACK DATA

16. Your stack identification Mechanical Test Vent

17. Are other sources vented to this stack: ☐ Yes ☒ No
If, yes, identify sources NA

18. Type: ☒ Round, top inside diameter dimension 8"
☐ Rectangular, top inside dimensions (L) _____ x(W) _____

19. Height: Above roof 9 ft., above ground 37.25 ft.

20. Exit gas: Temp. 70 °f, Volume 1203.67 ACFM, Velocity 3450 ft./min.

21. Continuous monitoring equipment: ☒ Yes ☐ No
If yes, indicate: Type NA, Manufacturer Eberline
Make or Model AMS-4, Pollutant(s) monitored beta radiation

22. Emission date: Emissions from this source have been determined and such data is included with this appendix:

If yes, check method: ☒ Stack Test ☐ Emission factor ☐ Material Balance

Completed by Eddie R. Swindall, Date March 15, 1996

EPA-1100

NOTES ON APPENDIX A, PROCESS PERMIT TO INSTALL APPLICATION FOR BATTELLE - WEST JEFFERSON FACILITY JN-1 MECHANICAL TEST CELL

Item #	Comment
3	There is no process which takes in this cell. The cell was utilized in the past for high level radiation research; however, it is presently out of service and awaiting decontamination and decommissioning (D&D).
4	There is no manufacturer, make or model number for this cell. It was designed and constructed by Battelle.
5	This question is not applicable as this test cell is out of service and the research which once took place cannot be quantified in pounds/hour.
6	The unit is exhausted through control equipment, then out a stack on the roof. Ambient pressure monitoring is used to ensure that this and other cells within the building are the point of lowest pressure, thus ensuring that all potential airborne contaminants within the building are drawn into the cell and vented through control equipment prior to exhausting the building air to the atmosphere..
7	No product is being generated; however, the ventilation system operates continuously to maintain negative pressure.
8-13	As no product is being generated, annual and hourly production questions are not applicable and there are no raw materials utilized. Until the cells are decommissioned, the ventilation system and control equipment operate continuously, barring equipment malfunction.
14	See attached diagram.
15(h)	The pressure drop across the rough and first HEPA filter is monitored and filters are changed if the pressure increases above nine inches. The pressure drop across

the second HEPA filter is also monitored and the filter is changed if the pressure increases above five inches. The filters are aligned in series.

---

20 Volume and velocity were measured during the most recent DOP test.

---

21 A continuous air monitor is used to monitor effluent gases in the vent on the backside of the HEPA filters for radionuclides. The monitor includes an in-line volumetric sampler which operates continuously and the sample filter paper is collected weekly. The weekly sample is analyzed for total Beta and total Alpha activity. Weekly samples are composited monthly and the composite is analyzed by gamma spectrometry. Monthly composite samples are again composited, quarterly, and this composite is analyzed for Uranium, Plutonium, and Strontium-90 isotopes. The monitor also continuously measures Beta activity from the filter paper and records this value on a chart recorder. When an elevated activity level is detected, an alarm sounds locally, on the JN-1 alarm control panel, and in the West Jefferson South area guard house. This alarm will also sound if there is a malfunction of the air monitor. A separate alarm will also sound in the same locations if there is an exhaust fan malfunction.

In addition to the air monitor, the pressure gauges for the filters are checked at least daily and the HEPA filters are DOP tested annually.

---

22 As previously stated, representative samples of the stack particulate emissions are continuously collected and the samples are analyzed for various radionuclides weekly, monthly, and quarterly, according to the *Site Environmental Monitoring Plan*. These results are compiled and summarized annually in the *Site Environmental Report* (SER). A copy of the latest SER is enclosed.

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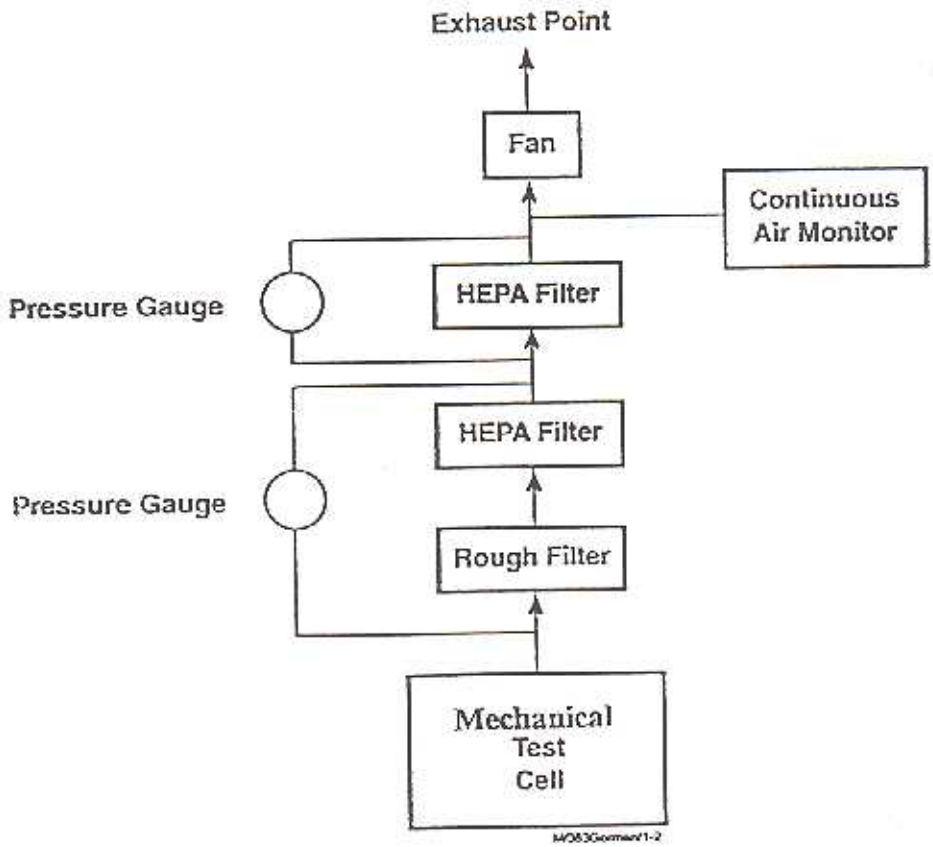
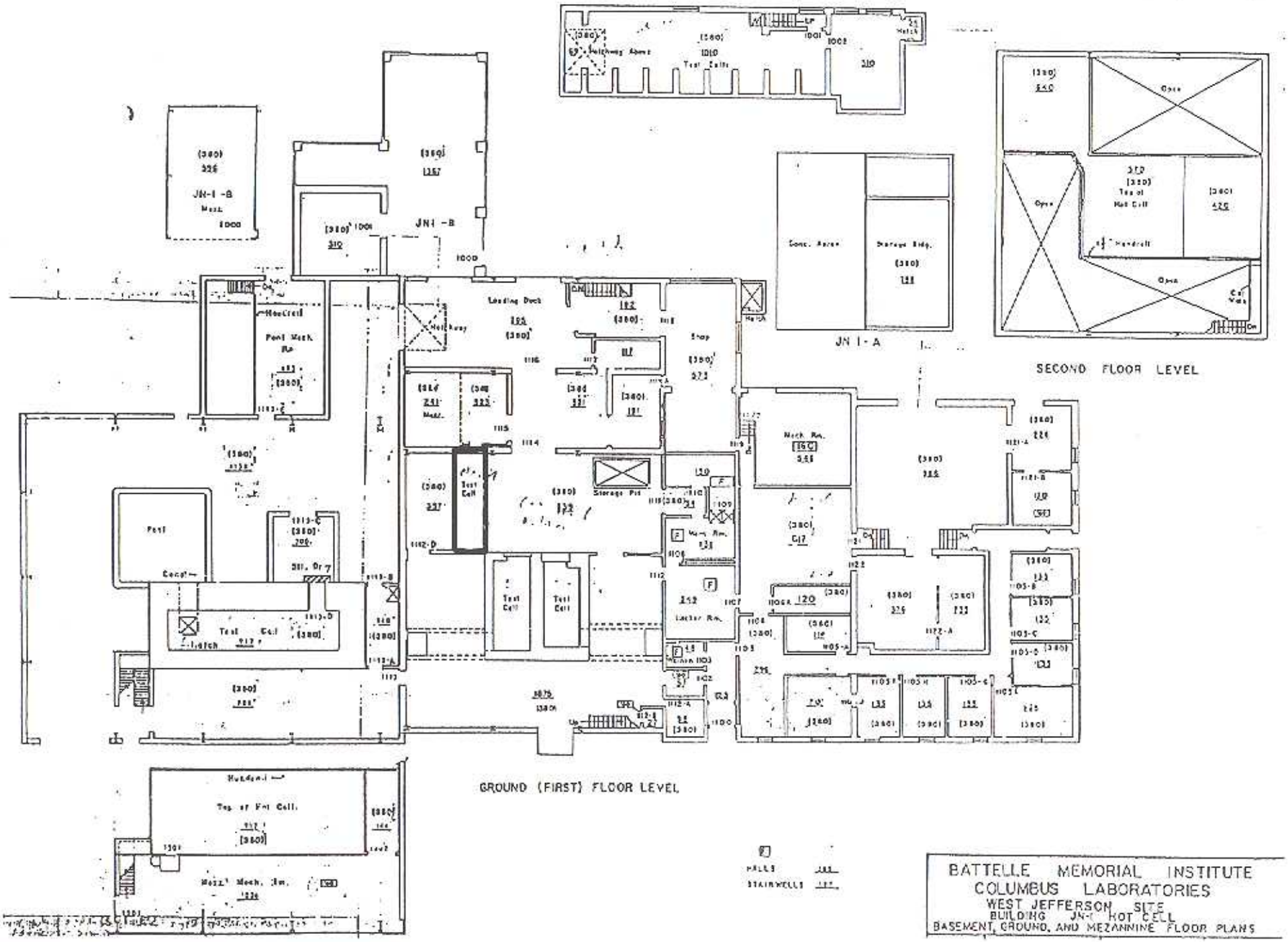
JN-1 Mechanical Test Cell -
West Jefferson Facility



Item 14. Process Flow Diagram



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WEST JEFFERSON SITE
BUILDING JN-1 HOT CELL
BASEMENT, GROUND, AND MEZANNINE FLOOR PLANS

FOR OFFICIAL USE ONLY

Premise No. _____
Source No. _____

APPENDIX A, PROCESS

PROCESS DATA

1. Name of process Radiological Research

2. End product of this process Radiological Information

3. Primary process equipment Control Area

   Your identification JN-1 Control Area Year Installed 1955

4. Manufacturer NA - See Notes Make or Model NA

5. Capacity of equipment (lbs./hr): Rated NA Max. NA-See notes

6. Method of exhaust ventilation: ☒ Stack ☐ Window fan ☐ Roof vent See notes
   ☐ Other, describe _____
   Are there multiple exhausts? ☐ Yes ☒ No

OPERATING DATA

7. Normal operating schedule: 24 hrs./day, 7 days/wk., 52 wks./year. See notes

8. Percent annual production (finished units) by season: See notes
   Winter ____ Spring ____ Summer ____ Fall ____

9. Hourly production rates (lbs.): Average NA Maximum NA - See notes

10. Annual production (indicate units) NA - See notes
    Projected percent annual increase in production NA

11. Type of operation: ☒ Continuous ☐ Batch See notes

12. If batch, indicate Minutes per cycle ____ Minutes between cycles ____

13. Materials used in process: See notes

List of Raw Materials	Principal Use	Amounts (lbs./hr.)
NA	NA	NA

14. A PROCESS FLOW DIAGRAM MUST BE INCLUDED WITH THIS APPENDIX. Show entry and exit points of all raw materials, intermediate products, by-products and finished products. Label all materials including airborne contaminants and other waste materials. Label the process equipment and control equipment.

(continued on reverse side)

Control Equipment Codes:

(A) Settling chamber	(G) Cyclonic scrubber	(M) Adsorber
(B) Cyclone	(H) Impingement scrubber	(N) Condenser
(C) Multiple cyclone	(I) Orifice scrubber	(O) Afterburner - catalytic
(D) Electrostatic precipitator	(J) Venturi scrubber	(P) Afterburner - thermal
(E) Fabric filter	(K) Plate or tray tower	(Q) Other, describe Particulate Filter
(F) Spray chamber	(L) Packed tower	

15. Control Equipment data:

Item	Primary Collector	Secondary Collector
	Rough Filter	Dual HEPA Filter
(a) Type (See above code	Q	Q
(b) Manufacturer	American Air Filter	American Air Filter
(c) Model No.	147-002-863	105-883025-507
(d) Year installed		
(e) Your identification	None	None
(f) Pollutant Controlled	Particulate/Radionuclides	
(g) Controlled pollutant emission rate (if known)	NK	NK
(h) Pressure drop	9" See notes	5" See notes
(i) Design efficiency	30-35%	99.97%
(j) Operating efficiency	NK	99.95%

STACK DATA

16. Your stack identification Control Area Vent

17. Are other sources vented to this stack: ☐ Yes ☒ No
If, yes, identify sources NA

18. Type: ☒ Round, top inside diameter dimension 12"
☐ Rectangular, top inside dimensions (L)_____ x(W)_____

19. Height: Above roof 9.83 ft., above ground 38.08 ft.

20. Exit gas: Temp. 70 °f, Volume 2747.5 ACFM, Velocity 3500 ft./min.

21. Continuous monitoring equipment: ☒ Yes ☐ No
If yes, indicate: Type NA, Manufacturer Eberline
Make or Model AMS-4, Pollutant(s) monitored beta radiation

22. Emission date: Emissions from this source have been determined and such data is included with this appendix:

If yes, check method: ☒ Stack Test ☐ Emission factor ☐ Material Balance

Completed by Eddie R. Swindall, Date March 15, 1996

EPA-3100

NOTES ON APPENDIX A, PROCESS PERMIT TO INSTALL APPLICATION FOR BATTELLE - WEST JEFFERSON FACILITY JN-1 CONTROL AREA

Item #	Comment
3	There is no process which takes in this area. The area contains low level radiological contamination on surfaces and equipment.
4	There is no manufacturer, make or model number for the control area. The building was designed and constructed by Battelle.
5	This question is not applicable to the control area.
6	The unit is exhausted through two separate vents equipped with pollution control equipment. These vents join together and exhaust through a single stack on the building roof. The room must be ventilated to prevent the build-up of radioactive contaminants.
7	No product is being generated; however, the ventilation system operates continuously.
8-13	As no product is being generated, annual and hourly production questions are not applicable and there are no raw materials utilized. Until the cells are decommissioned, the ventilation system and control equipment operate continuously, barring equipment malfunction.
14	See attached diagram.
15(h)	The pressure drop across the rough and first HEPA filter is monitored and filters are changed if the pressure increases above nine inches. The pressure drop across the second HEPA filter is also monitored and the filter is changed if the pressure increases above five inches. The filters are aligned in series.

20 The exit volume and velocity from the combined exhaust stack for this area have never been measured. The volume and velocity are measured after the second HEPA filter in each of the individual vents during the annual DOP test, the volume and velocity measured in both vents were identical.

21 A continuous air monitor is used to monitor effluent gases in the vent on the backside of the HEPA filters for radionuclides. The monitor includes an in-line volumetric sampler which operates continuously and the sample filter paper is collected weekly. The weekly sample is analyzed for total Beta and total Alpha activity. Weekly samples are composited monthly and the composite is analyzed by gamma spectrometry. Monthly composite samples are again composited, quarterly, and this composite is analyzed for Uranium, Plutonium, and Strontium-90 isotopes. The monitor also continuously measures Beta activity from the filter paper and records this value on a chart recorder. When an elevated activity level is detected, an alarm sounds locally, on the JN-1 alarm control panel, and in the West Jefferson South area guard house. This alarm will also sound if there is a malfunction of the air monitor. A separate alarm will also sound in the same locations if there is an exhaust fan malfunction.

In addition to the air monitor, the pressure gauges for the filters are checked at least daily and the HEPA filters are DOP tested annually.

22 As previously stated, representative samples of the stack particulate emissions are continuously collected and the samples are analyzed for various radionuclides weekly, monthly, and quarterly, according to the *Site Environmental Monitoring Plan*. These results are compiled and summarized annually in the *Site Environmental Report* (SER). A copy of the latest SER is enclosed.

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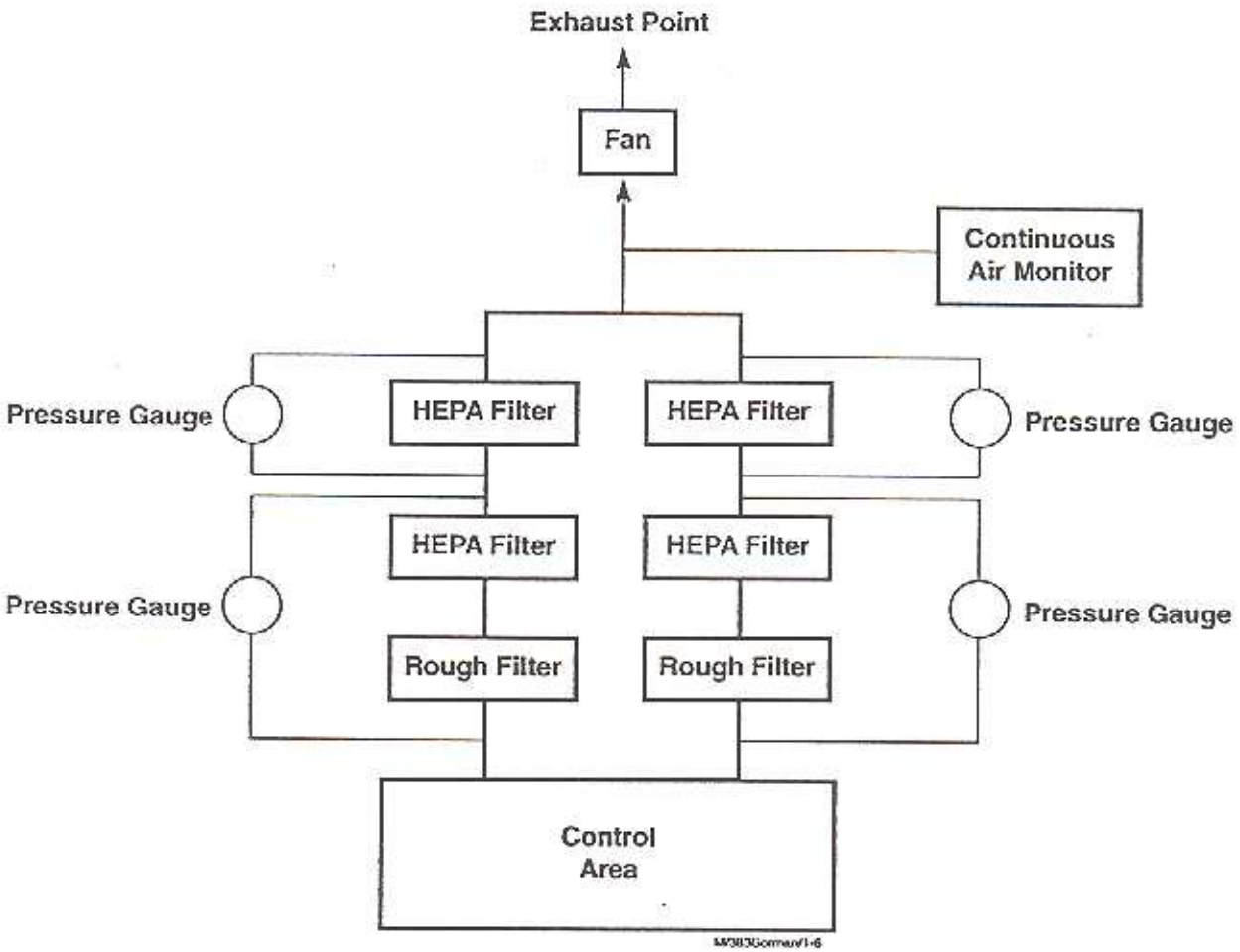
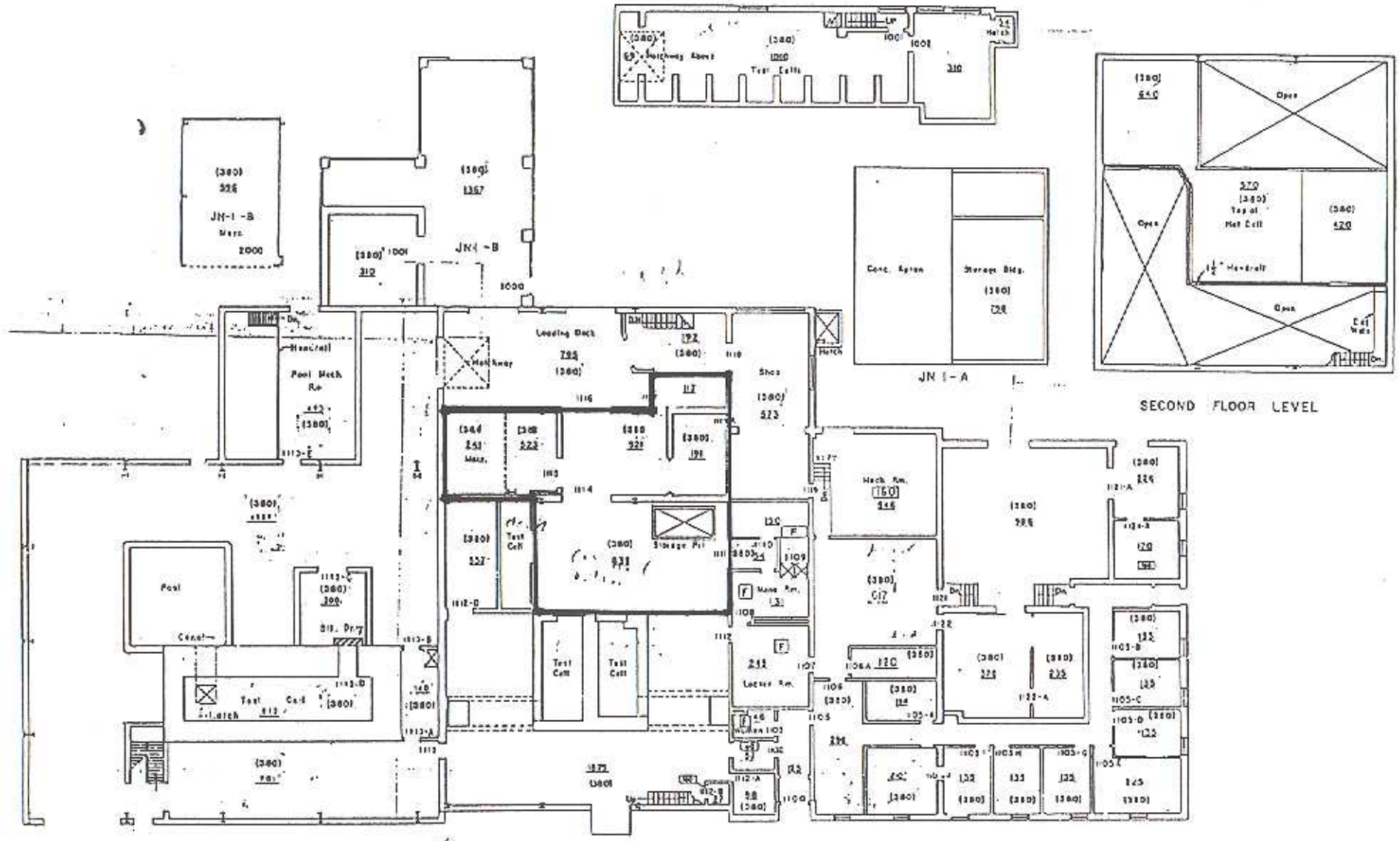
JN-1 Control Area -
West Jefferson Facility



Item 14. Process Flow Diagram



BATTELLE MEMORIAL INSTITUTE
COLUMBUS LABORATORIES
WEST JEFFERSON SITE
BUILDING JN-1 HOT CELL
BASEMENT, GROUND, AND MEZZANINE FLOOR PLANS

FOR OFFICIAL USE ONLY

Premise No. _____
Source No. _____

APPENDIX A, PROCESS

PROCESS DATA

1. Name of process Radioanalytical Laboratory (RAL)

2. End product of this process Radiological Concentration Data

3. Primary process equipment Ventilation Hood (to dissipate Heat)

   Your identification RAL Canopy Hood Year Installed 1971

4. Manufacturer Built by Battelle Make or Model NA

5. Capacity of equipment (lbs./hr): Rated NA Max. NA - See notes

6. Method of exhaust ventilation: ☒ Stack ☐ Window fan ☐ Roof vent
   ☐ Other, describe _____
   Are there multiple exhausts? ☐ Yes ☒ No

OPERATING DATA

7. Normal operating schedule: 24 hrs./day, 7 days/wk., 52 wks./year. See notes

8. Percent annual production (finished units) by season:
   Winter ____ Spring ____ Summer ____ Fall ____ See notes

9. Hourly production rates (lbs.): Average NA Maximum NA - See notes

10. Annual production (indicate units) NA - See notes
    Projected percent annual increase in production ____

11. Type of operation: ☒ Continuous ☐ Batch

12. If batch, indicate Minutes per cycle NA Minutes between cycles NA

13. Materials used in process: See notes

List of Raw Materials	Principal Use	Amounts (lbs./hr.)
NA	NA	NA

14. A PROCESS FLOW DIAGRAM MUST BE INCLUDED WITH THIS APPENDIX. Show entry and exit points of all raw materials, intermediate products, by-products and finished products. Label all materials including airborne contaminants and other waste materials. Label the process equipment and control equipment.

(continued on reverse side)

Control Equipment Codes:

(A) Settling chamber	(G) Cyclonic scrubber	(M) Adsorber
(B) Cyclone	(H) Impingement scrubber	(N) Condenser
(C) Multiple cyclone	(I) Orifice scrubber	(O) Afterburner - catalytic
(D) Electrostatic precipitator	(J) Venturi scrubber	(P) Afterburner - thermal
(E) Fabric filter	(K) Plate or tray tower	(Q) Other, describe Particulate Filter
(F) Spray chamber	(L) Packed tower	

15. Control Equipment data:

Item	Primary Collector	Secondary Collector
	Single HEPA Filter	
(a) Type (See above code	Q	
(b) Manufacturer	American Air Filter	
(c) Model No.	105-883025-507	
(d) Year installed	1971	
(e) Your identification	None	
(f) Pollutant Controlled	Particulate	
(g) Controlled pollutant emission rate (if known)	NK	
(h) Pressure drop	5"	
(i) Design efficiency	99.97%	
(j) Operating efficiency	99.95%	

STACK DATA

16. Your stack identification RAL Canopy Hood Vent

17. Are other sources vented to this stack: ☐ Yes ☒ No
If, yes, identify sources NA

18. Type: ☒ Round, top inside diameter dimension 12"
☐ Rectangular, top inside dimensions (L) ____ x(W) ____

19. Height: Above roof 2 ft., above ground 27 ft.

20. Exit gas: Temp. 70 °f, Volume 1553.65 ACFM, Velocity 2850 ft./min. See notes

21. Continuous monitoring equipment: ☐ Yes ☒ No See notes
If yes, indicate: Type ____, Manufacturer ____
Make or Model ____, Pollutant(s) monitored ____

22. Emission date: Emissions from this source have been determined and such data is included with this appendix: NK - See notes

If yes, check method: ☐ Stack Test ☐ Emission factor ☐ Material Balance

Completed by E.R. Swindall, Date March 15, 1996

EPA-3100

NOTES ON APPENDIX A, PROCESS PERMIT TO INSTALL APPLICATION FOR BATTELLE - WEST JEFFERSON FACILITY JN-2 RAL CANOPY HOOD

Item #	Comment
5	This question is not applicable for a heat dissipation hood. The hood does not have a pounds/hour capacity.
7	This canopy hood ventilation system operates constantly for 365 days out of the year.
8-10	There is no material produced by the hoods, therefore questions 8-10 do not apply.
11-12	As previously mentioned, the hood operates continuously, barring an equipment malfunction.
13	There are no materials produced or used under the canopy hood. The hood is used to dissipate the heat from the oven used to dry environmental samples.
14	See attached diagram
15(h)	The pressure drop across the single HEPA filter is monitored and filter is changed if the pressure increases above five inches.
20	Velocity and volume were measured during the most recent DOP test.
21	The emissions from this hood are not monitored; however, a continuous air monitor is used to monitor ambient air conditions in the laboratory near the canopy hood. The air monitor includes an in-line volumetric sampler which operates continuously and the sample filter paper is collected weekly. The weekly sample is analyzed for total Beta and total Alpha activity. Weekly samples are composited

21 cont. monthly and the composite is analyzed by gamma spectrometry Monthly composite samples are again composited, quarterly, and this composite is analyzed for Uranium, Plutonium, and Strontium-90 isotopes.

In addition to the air monitor, the pressure gauges for the filters are checked at least weekly and the HEPA filters are DOP tested annually

---

22 As previously mentioned, representitive samples of the ambient air in the laboratory are continuously collected and the samples are analyzed for various radionuclides weekly, monthly, and quarterly. Actual stack emissions are not known as there are no emission tests conducted on the effluent from the stack. Area monitors are used to determine radionuclide activity at the property boundary. These results are compiled and summarized annually in the *Site Environmental Report* (SER). A copy of the latest SER is enclosed

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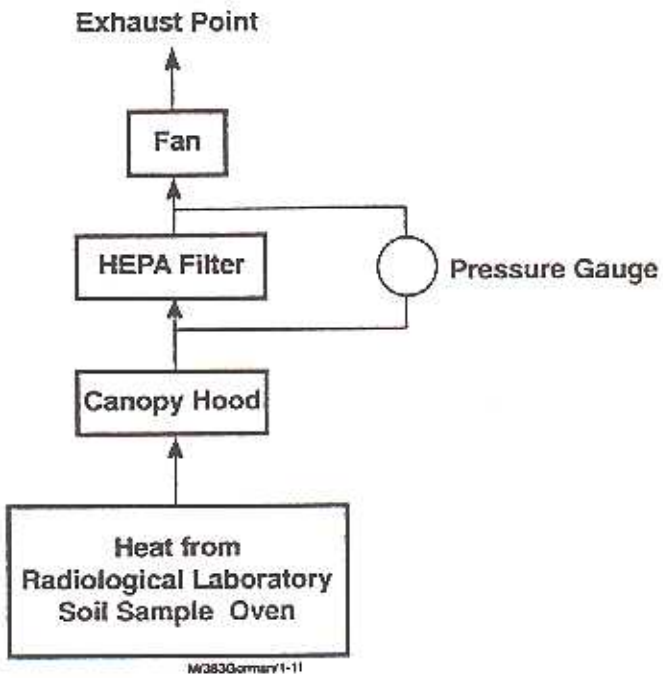
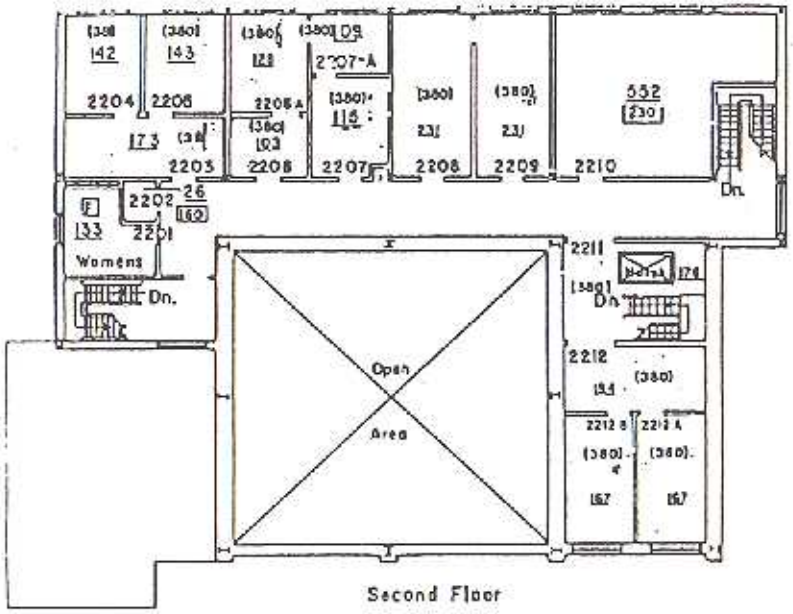
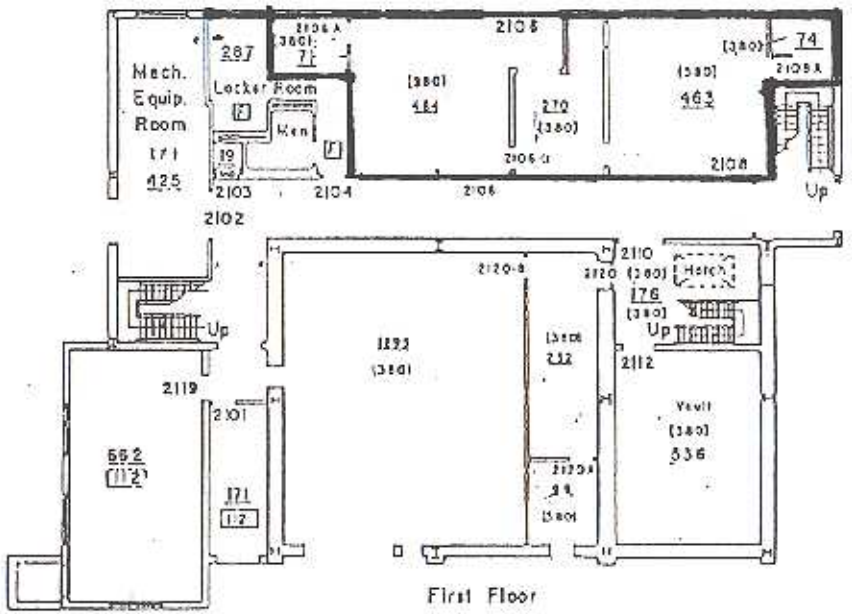
JN-2 Radiological Laboratory Canopy Hood -
West Jefferson Facility



Item 14. Process Flow Diagram



Second Floor



First Floor

	1ST.	2ND.
HALLS	243	226
STAIRWELLS	181	88

BATTELLE MEMORIAL INSTITUTE
COLUMBUS LABORATORIES
WEST JEFFERSON SITE
BUILDING JN-2 (CRITICAL ASSEMBLY)
GROUND & SECOND FLOOR PLAN

1/16" = 1'-0"	By J. Phillips 10-5-65	Revised 9-27-91	JN2-1-2

FOR OFFICIAL USE ONLY

Premise No._____
Source No._____

APPENDIX A, PROCESS

PROCESS DATA

1. Name of process Radioanalytical Laboratory (RAL)

2. End product of this process Radiological Concentration Data

3. Primary process equipment Chemical Ventilation Hood

   Your identification RAL Chemical Hoods Year Installed ~ 1985

4. Manufacturer Kewaunee Make or Model NK

5. Capacity of equipment (lbs./hr): Rated see NA-notes Max. NA

6. Method of exhaust ventilation: ☒ Stack ☐ Window fan ☐ Roof vent
   ☐ Other, describe _____
   Are there multiple exhausts? ☐ Yes ☒ No

OPERATING DATA

7. Normal operating schedule: 24 hrs./day, 7 days/wk., 52 wks./year.

8. Percent annual production (finished units) by season: See notes
   Winter____ Spring____ Summer____ Fall____

9. Hourly production rates (lbs.): Average NA see notes Maximum NA

10. Annual production (indicate units) NA - See notes
    Projected percent annual increase in production NA

11. Type of operation: ☒ Continuous ☐ Batch

12. If batch, indicate Minutes per cycle NA Minutes between cycles NA

13. Materials used in process: See notes

List of Raw Materials	Principal Use	Amounts (lbs./hr.)
NA	NA	NA

14. A PROCESS FLOW DIAGRAM MUST BE INCLUDED WITH THIS APPENDIX. Show entry and exit points of all raw materials, intermediate products, by-products and finished products. Label all materials including airborne contaminants and other waste materials. Label the process equipment and control equipment.

(continued on reverse side)

CONTROL EQUIPMENT

Control Equipment Codes:

(A) Settling chamber	(G) Cyclonic scrubber	(M) Adsorber
(B) Cyclone	(H) Impingement scrubber	(N) Condenser
(C) Multiple cyclone	(I) Orifice scrubber	(O) Afterburner - catalytic
(D) Electrostatic precipitator	(J) Venturi scrubber	(P) Afterburner - thermal
(E) Fabric filter	(K) Plate or tray tower	(Q) Other, describe particulate filter
(F) Spray chamber	(L) Packed tower	

15. Control Equipment data:

Item	Primary Collector Single HEPA Filter	Secondary Collector
(a) Type (See above code	Q	
(b) Manufacturer	American Air Filter	
(c) Model No.	# 105- 883025-507	
(d) Year installed	1985	
(e) Your identification	none	
(f) Pollutant Controlled	Particulate	
(g) Controlled pollutant emission rate (if known)	NK	
(h) Pressure drop	5" see notes	
(i) Design efficiency	99.97%	
(j) Operating efficiency	99.95%	

STACK DATA

16. Your stack identification RAL Chemical Hood Vent

17. Are other sources vented to this stack: ☐ Yes ☒ No
If, yes, identify sources NA

18. Type: ☒ Round, top inside diameter dimension 12"
☐ Rectangular, top inside dimensions (L) _____ x(W) _____

19. Height: Above roof 36 ft., above ground 61 ft.

20. Exit gas: Temp. 70 °F, Volume see notes ACFM, Velocity see notes ft./min.

21. Continuous monitoring equipment: ☒ Yes ☐ No see notes
If yes, indicate: Type _____, Manufacturer _____
Make or Model _____, Pollutant(s) monitored _____

22. Emission date: Emissions from this source have been determined and such data is included with this appendix: NK - See notes

If yes, check method: ☒ Stack Test ☐ Emission factor ☐ Material Balance

Completed by E.R. Swindall, Date March 15, 1996

EPA-3100

NOTES ON APPENDIX A, PROCESS PERMIT TO INSTALL APPLICATION FOR BATTELLE - WEST JEFFERSON FACILITY JN-2 RAL CHEMICAL HOODS

Item #	Comment
5	This question is not applicable for a chemical ventilation hood. The hood does not have a pounds/hour capacity.
6	The vents from these four hoods combined to exit from one stack on the roof.
7	The hoods ventilation system operates continuously to maintain negative pressure inside the laboratory.
8-10	There is no material produced by the hoods, therefore questions 8-10 do not apply.
11-12	The hoods ventilation system operates continuously, barring an equipment malfunction.
13	There are no materials produced under the hoods; however, chemicals are utilized and radioactive materials are analyzed. The chemicals used in the laboratory are listed in the **Table of Chemical Data**. Not all of these materials are used under these hoods.
14	See attached diagram.
15	Two HEPA filters are used to control the emissions from these hoods. Each HEPA filter services two hoods. The ventilation ducts combine after the HEPA filters to exhaust through a single roof stack.
15(h)	The pressure drop across the single HEPA filter is monitored and filters are changed if the pressure increases above five inches.

20 Velocity and volume of the exhaust air are measured after the HEPA filters during each annual DOP test. During the most recent DOP test, velocity and volume were measured in the east and west ducts at 2000 ft/min and 1090 cfm, and 2100 ft/min and 114.79 cfm, respectively.

21 The effluent gases in the combined vent are monitored after the HEPA filters for radionuclides. An in-line volumetric sampler operates continuously and the sample filter paper is collected weekly. The weekly sample is analyzed for total Beta and total Alpha activity. Weekly samples are composited monthly and the composite is analyzed by gamma spectrometry. Monthly composite samples are again composited, quarterly, and this composite is analyzed for Uranium, Plutonium, and Strontium-90 isotopes.

In addition to the air monitor, the pressure gauges for the filters are checked at least weekly and the HEPA filters are DOP tested annually.

22 As stated above, representative samples of the stack particulate emissions are continuously collected and the samples are analyzed for various radionuclides weekly, monthly, and quarterly, according to the *Site Environmental Monitoring Plan*. These results are compiled and summarized annually in the *Site Environmental Report* (SER). A copy of the latest SER is enclosed.

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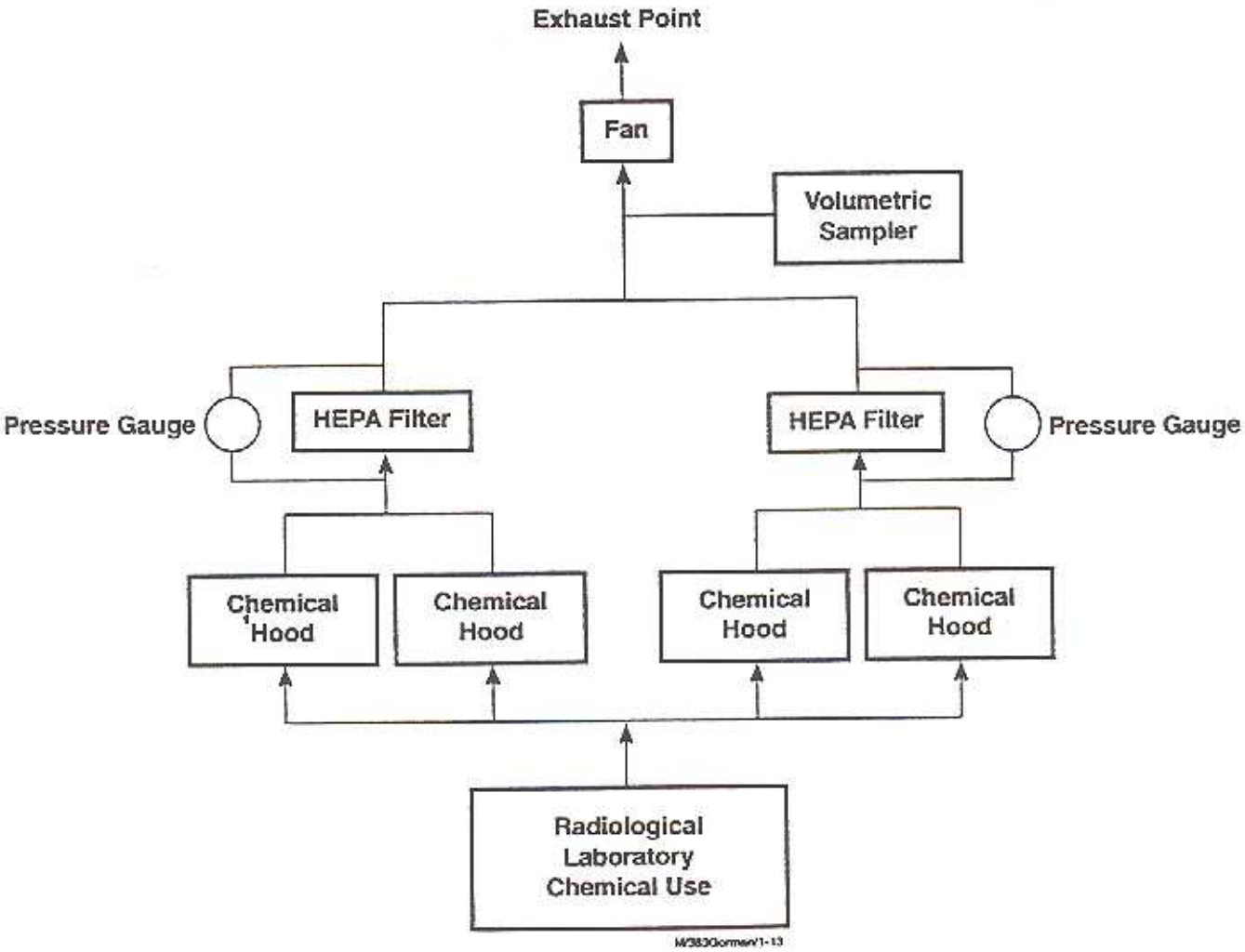
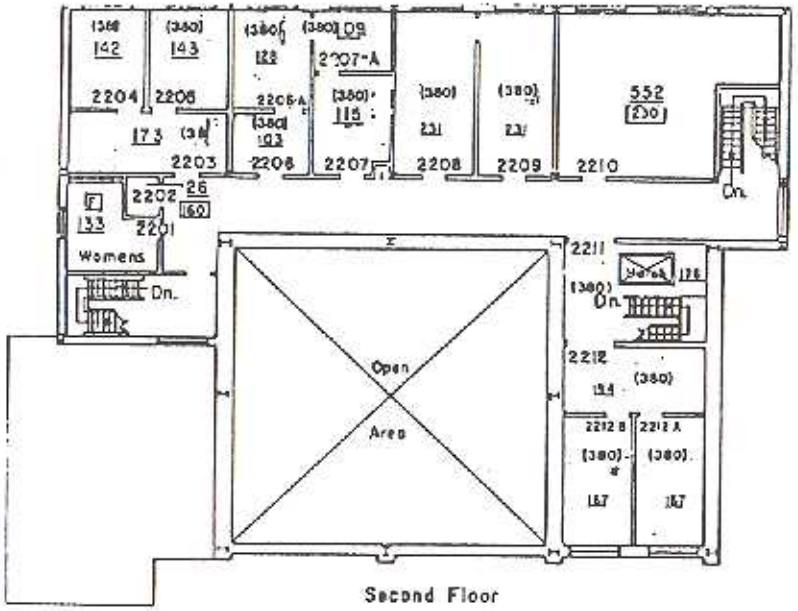
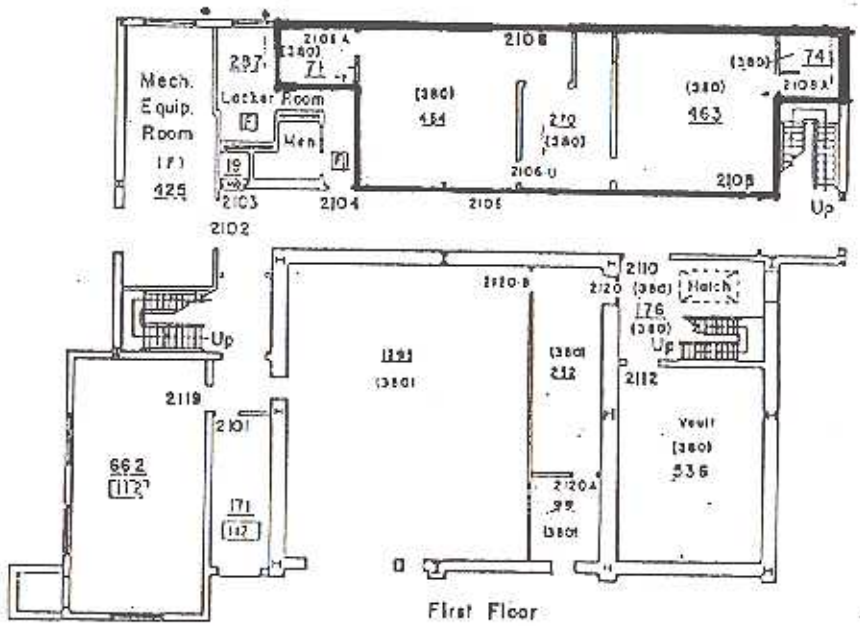
JN-2 Radiological Laboratory Chemical Hoods -
West Jefferson Facility



Item 14. Process Flow Diagram





(F)	1ST.	2ND.
HALLS	755	776
STAIRWELLS	483	88

BATTELLE MEMORIAL INSTITUTE
COLUMBUS LABORATORIES
WEST JEFFERSON SITE
BUILDING JN-2 (CRITICAL ASSEMBLY)
GROUND & SECOND FLOOR PLAN

1/16" = 1'-0"	By J. Phillips 10-5-50	Revised 9-25-91	JN2-1-2

FOR OFFICIAL USE ONLY

Premise No. _____
Source No. _____

APPENDIX A, PROCESS

PROCESS DATA

1. Name of process Radioanalytical Laboratory (RAL)

2. End product of this process Radiological Concentration Data

3. Primary process equipment Chemical Ventilation Hood

   Your identification RAL Gamma Hood Year Installed 1971

4. Manufacturer Kewaunee Scientific Make or Model NK

5. Capacity of equipment (lbs./hr): Rated see NA-notes Max. NA

6. Method of exhaust ventilation: ☒ Stack ☐ Window fan ☐ Roof vent
   ☐ Other, describe _____
   Are there multiple exhausts? ☐ Yes ☒ No

OPERATING DATA

7. Normal operating schedule: 24 hrs./day, 7 days/wk., 52 wks./year.

8. Percent annual production (finished units) by season:
   Winter ____ Spring ____ Summer ____ Fall ____ See notes

9. Hourly production rates (lbs.): Average NA see notes Maximum NA

10. Annual production (indicate units) NA - See notes
    Projected percent annual increase in production NA

11. Type of operation: ☒ Continuous ☐ Batch

12. If batch, indicate Minutes per cycle NA Minutes between cycles NA

13. Materials used in process: NA

List of Raw Materials	Principal Use	Amounts (lbs./hr.)
NA	NA	NA

14. A PROCESS FLOW DIAGRAM MUST BE INCLUDED WITH THIS APPENDIX. Show entry and exit points of all raw materials, intermediate products, by-products and finished products. Label all materials including airborne contaminants and other waste materials. Label the process equipment and control equipment.

(continued on reverse side)

Control Equipment Codes:

(A) Settling chamber	(G) Cyclonic scrubber	(M) Adsorber
(B) Cyclone	(H) Impingement scrubber	(N) Condenser
(C) Multiple cyclone	(I) Orifice scrubber	(O) Afterburner - catalytic
(D) Electrostatic precipitator	(J) Venturi scrubber	(P) Afterburner - thermal
(E) Fabric filter	(K) Plate or tray tower	(Q) Other, describe particulate filter
(F) Spray chamber	(L) Packed tower	

15. Control Equipment data:

Item	Primary Collector Single HEPA Filter	Secondary Collector
(a) Type (See above code	Q	
(b) Manufacturer	American Air Filter	
(c) Model No.	# 105- 883025-507	
(d) Year installed	1971	
(e) Your identification	None	
(f) Pollutant Controlled	Particulate	
(g) Controlled pollutant emission rate (if known)	NK	
(h) Pressure drop	3"	
(i) Design efficiency	99.97%	
(j) Operating efficiency	99.95%	

STACK DATA

16. Your stack identification RAL Comma Hood Vent

17. Are other sources vented to this stack: ☐ Yes ☒ No
If, yes, identify sources NA

18. Type: ☒ Round, top inside diameter dimension 12"
☐ Rectangular, top inside dimensions (L) _____ x(W) _____

19. Height: Above roof 30 ft., above ground 55 ft.

20. Exit gas: Temp. 70 °f, Volume 1100 ACFM, Velocity 275 ft./min.

21. Continuous monitoring equipment: ☐ Yes ☒ No See Notes
If yes, indicate: Type _____, Manufacturer _____
Make or Model _____, Pollutant(s) monitored _____

22. Emission date: Emissions from this source have been determined and such data is included with this appendix: NK - See notes

If yes, check method: ☐ Stack Test ☐ Emission factor ☐ Material Balance

Completed by E.R. Swindall, Date March 15, 1996

EPA-3100

NOTES ON APPENDIX A, PROCESS
PERMIT TO INSTALL APPLICATION FOR
BATTELLE - WEST JEFFERSON FACILITY
JN-2 RAL GAMMA HOOD

Item #	Comment
5	This question is not applicable for a chemical ventilation hood. The hood does not have a pounds/hour capacity.
7	The gamma hood ventilation system operates continuously to maintain negative pressure inside the laboratory.
8-10	There are no materials produced or used under the gamma hood; however, chemicals are utilized for the preparation of chemical standards and materials are analyzed for the presence of radiological contamination. The chemicals used in the laboratory are listed in the **Table of Chemical Data**. Not all of these materials are used under this hood.
14	See attached diagram.
15(h)	The pressure drop across the single HEPA filter is monitored and filters are changed if the pressure increases above five inches.
20	Velocity and volume were measured during the most recent DOP test.
21	The emissions from this hood are not monitored, however, a continuous air monitor is used to monitor ambient air conditions in the laboratory near the canopy hood. The monitor includes an in-line volumetric sampler which operates continuously and the sample filter paper is collected weekly. The weekly sample is analyzed for total Beta and total Alpha activity. Weekly samples are composited monthly and the composite is analyzed by gamma spectrometry. Monthly composite samples are again composited, quarterly, and this composite is analyzed for Uranium, Plutonium, Strontium-90 and isotopes.

21 cont. In addition to the air monitor, the pressure gauges for the filters are checked at least weekly and the HEPA filters are DOP tested annually.

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22 There are no emissions tests conducted on the effluent air from this source's stack. Area monitors are used to determine radionuclide activity at the property boundary. These results are compiled and summarized annually in the *Site Environmental Report* (SER). A copy of the latest SER is enclosed.

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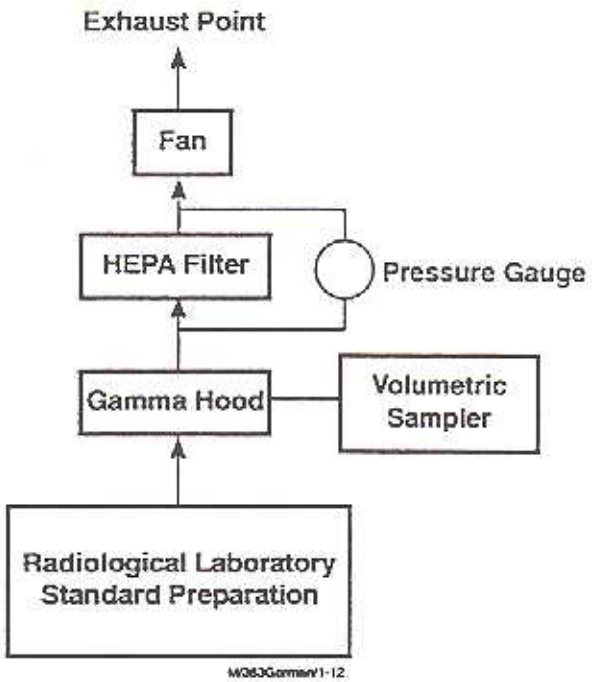
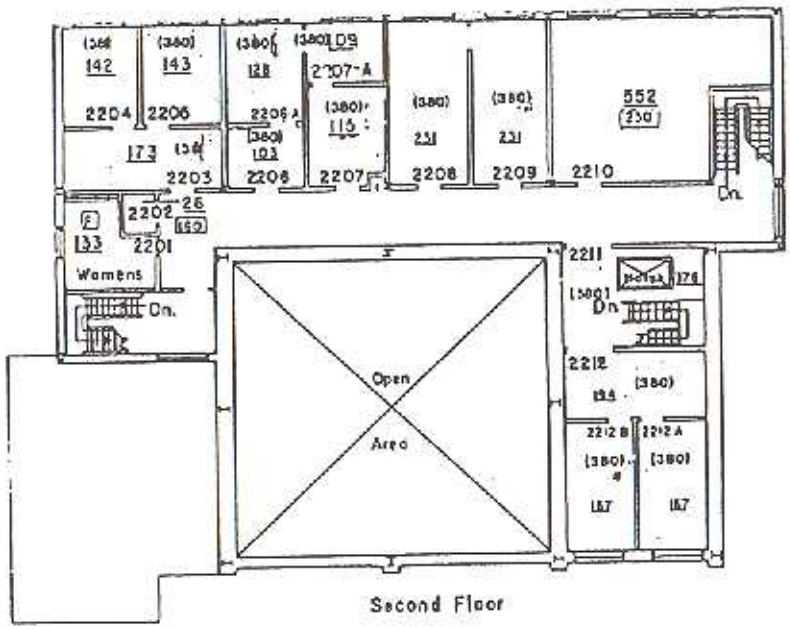
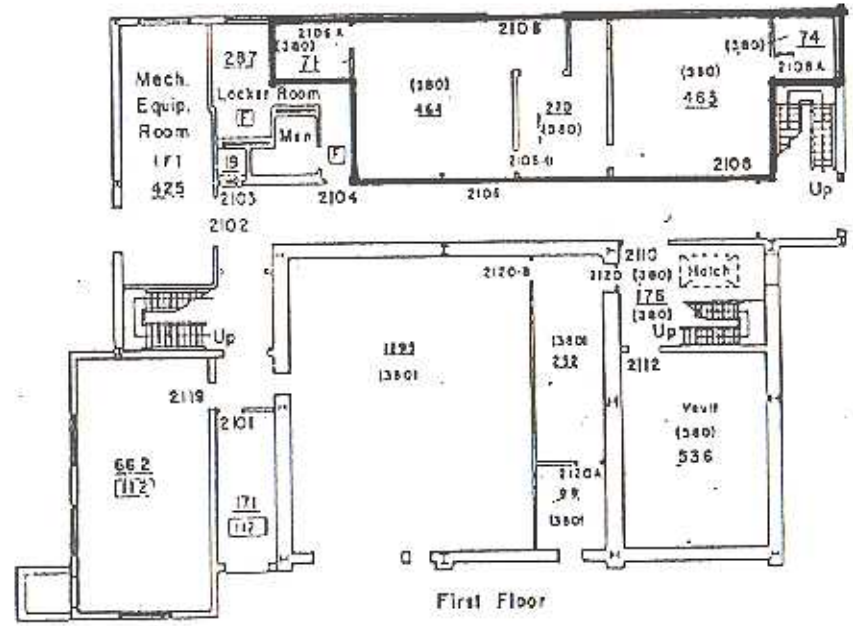
JN-2 Radiological Laboratory Gamma Hood -
West Jefferson Facility



Item 14. Process Flow Diagram



Second Floor



First Floor

F	1ST.	2ND.
HALLS	733	736
STAIRWELLS	692	99

BATTELLE MEMORIAL INSTITUTE
COLUMBUS LABORATORIES
WEST JEFFERSON SITE
BUILDING JN-2 (CRITICAL ASSEMBLY)
GROUND & SECOND FLOOR PLAN

1/16" = 1'-0"	By J. Phillips 10-5-65	Revised 9-27-91	JN2-1-2

FOR OFFICIAL USE ONLY

Premise No. _____
Source No. _____

APPENDIX A, PROCESS

PROCESS DATA

1. Name of process Material Storage

2. End product of this process Material Storage

3. Primary process equipment Sealed Storage Room

   Your identification JN-3 Vault Year Installed 1976

4. Manufacturer NA - See Notes Make or Model NA

5. Capacity of equipment (lbs./hr): Rated NA Max. NA-See notes

6. Method of exhaust ventilation: ☒ Stack ☐ Window fan ☐ Roof vent ☐ Other, describe _____

   Are there multiple exhausts? ☒ Yes ☐ No

OPERATING DATA

7. Normal operating schedule: 24 hrs./day, 7 days/wk., 52 wks./year. See notes

8. Percent annual production (finished units) by season: See notes
   Winter ____ Spring ____ Summer ____ Fall ____

9. Hourly production rates (lbs.): Average NA Maximum NA-See notes

10. Annual production (indicate units) NA - See notes
    Projected percent annual increase in production NA

11. Type of operation: ☒ Continuous ☐ Batch

12. If batch, indicate Minutes per cycle NA Minutes between cycles NA

13. Materials used in process: See notes

List of Raw Materials	Principal Use	Amounts (lbs./hr.)
NA	NA	NA

14. A PROCESS FLOW DIAGRAM MUST BE INCLUDED WITH THIS APPENDIX. Show entry and exit points of all raw materials, intermediate products, by-products and finished products. Label all materials including airborne contaminants and other waste materials. Label the process equipment and control equipment.

(continued on reverse side)

Control Equipment Codes:

(A) Settling chamber	(G) Cyclonic scrubber	(M) Adsorber
(B) Cyclone	(H) Impingement scrubber	(N) Condenser
(C) Multiple cyclone	(I) Orifice scrubber	(O) Afterburner - catalytic
(D) Electrostatic precipitator	(J) Venturi scrubber	(P) Afterburner - thermal
(E) Fabric filter	(K) Plate or tray tower	(Q) Other, describe Particulate Filter
(F) Spray chamber	(L) Packed tower	

15. Control Equipment data:

Item	Primary Collector Rough Filter	Secondary Collector Dual HEPA Filter
(a) Type (See above code	Q	Q
(b) Manufacturer	American Air Filter	American Air Filter
(c) Model No.	147-002-863	105-883-507
(d) Year installed	1976	1976
(e) Your identification	None	None
(f) Pollutant Controlled	Particulate/radionuclides	
(g) Controlled pollutant emission rate (if known)	NK	NK
(h) Pressure drop	NK	5" - See notes
(i) Design efficiency	30-35%	99.97%
(j) Operating efficiency	NK	99.95%

STACK DATA

16. Your stack identification JN-3 Vault Vent

17. Are other sources vented to this stack: ☐ Yes ☒ No
If, yes, identify sources NA

18. Type: ☒ Round, top inside diameter dimension 13"
☐ Rectangular, top inside dimensions (L) ____ x(W) ____

19. Height: Above roof 13 ft., above ground 38.1 ft.

20. Exit gas: Temp. 70 °f, Volume see notes ACFM, Velocity see notes ft./min.

21. Continuous monitoring equipment: ☐ Yes ☒ No see notes
If yes, indicate: Type ____, Manufacturer ____
Make or Model ____, Pollutant(s) monitored ____

22. Emission date: Emissions from this source have been determined and such data is included with this appendix:

If yes, check method: ☐ Stack Test ☐ Emission factor ☐ Material Balance

Completed by Eddie R. Swindall, Date March 15, 1996

EPA-3100

NOTES ON APPENDIX A, PROCESS
PERMIT TO INSTALL APPLICATION FOR
BATTELLE - WEST JEFFERSON FACILITY
JN-3 STORAGE VAULT

Item #	Comment
3	There is no process currently taking place in this room. The vault is utilized for the storage of radioactive material awaiting shipping.
4	There is no manufacturer, make or model number for this storage vault. It was designed and constructed by Battelle.
5	This question is not applicable for a storage vault.
6	The vault is exhausted through a set of rough and single HEPA filters in the basement of JN-3 and through another set of single HEPA filters on the third floor. After the final set of filters, the exhaust passes through a ventilation fan, then vents to through a stack on the roof. Storage requirements mandate that the ventilation system operate continuously.
7	No product is being generated; however, the ventilation system operates continuously.
8-13	As no product is being generated, annual and hourly production questions are not applicable and there are no raw materials utilized. The ventilation system and control equipment operate continuously, barring equipment malfunction.
14	See attached diagram.
15(h)	The pressure drop across the last set of HEPA filter is monitored and filters are changed if the pressure increases above five inches. All filter banks are aligned in series.

20 During annual DOP testing of the filters, velocity and volume are measured after the first and second set of HEPA filters (in basement and third floor, respectively). During the most recent DOP test the basement and third floor velocity and volume measurements were 2100 ft/min and 732.7 cfm, and 2200 ft/min and 767.7 cfm, respectively.

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21 A continuous air monitor is used to monitor the ambient air in the vault for radionuclides, however, there is no air monitor on the stack emissions. The monitor includes an in-line volumetric sampler which operates continuously and the sample filter paper is collected weekly. The weekly sample is analyzed for total Beta and total Alpha activity. Weekly samples are composited monthly and the composite is analyzed by gamma spectrometry. Monthly composite samples are again composited, quarterly, and this composite is analyzed for Uranium, Plutonium, and Strontium-90 isotopes.

In addition to the air monitor, the pressure gauges for the filters are checked at least weekly and the HEPA filters are DOP tested annually.

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22 There are no emissions tests conducted on the effluent air from this source's stack. Area monitors are used to determine radionuclide activity at the property boundary. These results are compiled and summarized annually in the *Site Environmental Report* (SER). A copy of the latest SER is enclosed.

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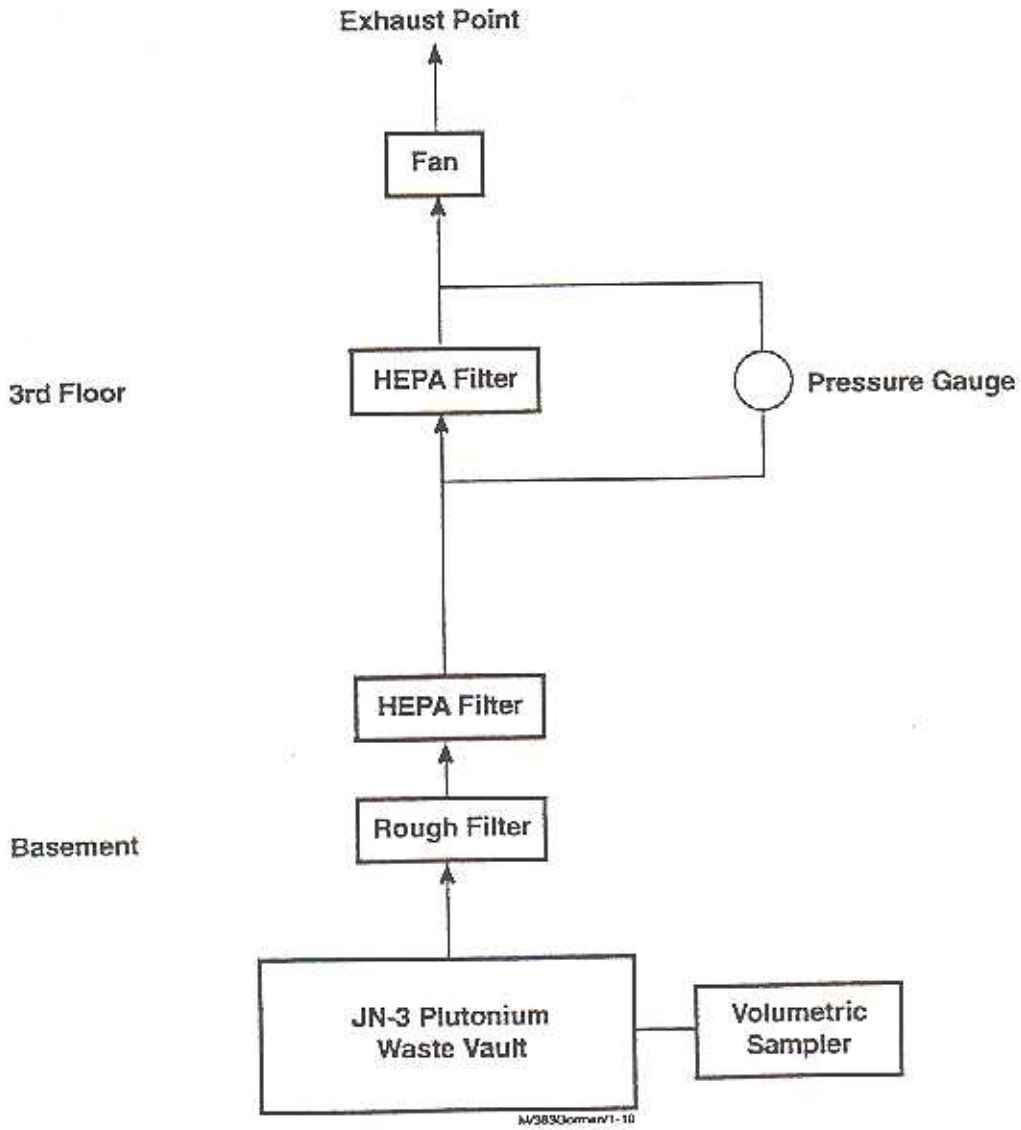
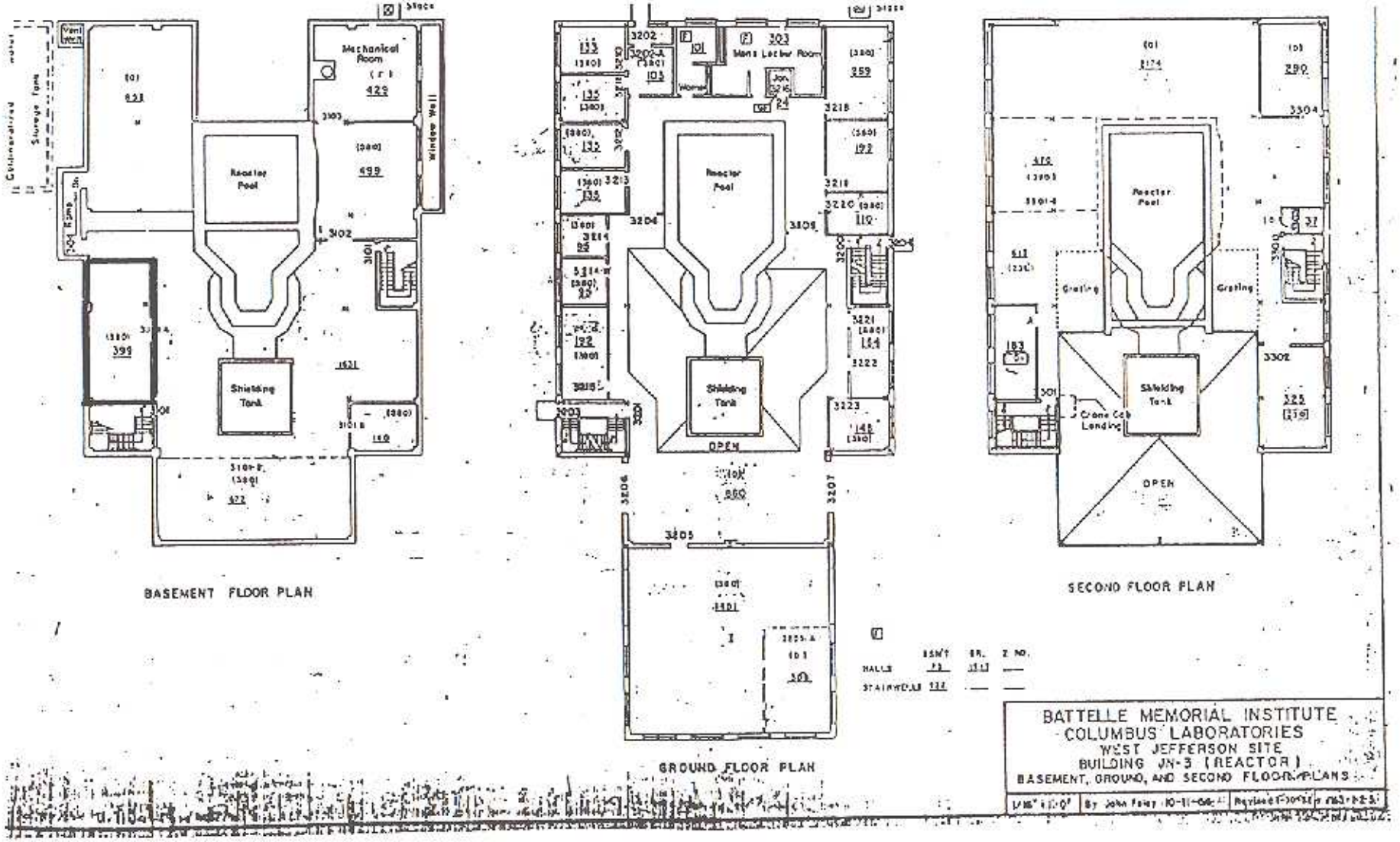
BATTELLE - WEST JEFFERSON FACILITY
JN-3 STORAGE VAULT



Item 14. Process Flow Diagram


Mechanical Room
429
Reactor Pool
Shielding Tank
Window Well
399
BASEMENT FLOOR PLAN
Men's Locker Room
359
Reactor Pool
Shielding Tank
OPEN
GROUND FLOOR PLAN
290
Reactor Pool
Grating
Grating
Shielding Tank
Crane Cab Landing
OPEN
325
SECOND FLOOR PLAN
BASEMENT, GROUND, AND SECOND FLOOR PLANS

SUPPORTING DOCUMENTS

Table of Existing Vents

TABLE OF EXISTING VENTS

APPENDIX A - PROCESS DATA				
Building	**Vent Source**	**Control Device**	**Monitored (yes/no)**	**Potential Contaminants**
JN-1	High Cell	Rough and dual HEPA filters	Yes. CAM, daily pressure gauge check, and annual DOP check.	Radionuclides
	Low Cell	Rough and dual HEPA filters	Yes. CAM, daily pressure gauge check, and annual DOP test.	Radionuclides
	Mechanical Test Cell	Rough and dual HEPA filters	Yes. CAM, daily pressure gauge check, and annual DOP test.	Radionuclides
	Control Area	Rough and dual HEPA filters (2 parallel sets)	Yes. CAM, daily pressure gauge check, and annual DOP test.	Radionuclides
	Evaporator	Rough and dual HEPA filters	Yes. CAM, daily pressure gauge check, and annual DOP test.	Radionuclides, diluted RAL liquid waste*
	Basement Cells (Alpha/Gamma Cells)	Rough and dual HEPA filters	Yes. CAM, daily pressure gauge check, and annual DOP test.	Radionuclides
	High Energy Cell	Rough and dual HEPA filters (3 parallel sets)	Yes. CAM, daily pressure gauge check, and annual DOP test.	Radionuclides
	Microprobe Room Chemical Hood	Rough and dual HEPA filters	Yes. Pressure gauge check daily when used, and annual DOP test.	Radionuclides
JN-2	RAL chemical hoods (2 sets of 2 hoods)	Single HEPA filter (each set of hoods)	Yes. Weekly pressure gauge check, post-HEPA volumetric radiological sample, and annual DOP test.	Radionuclides & Laboratory Chemicals*
	RAL Gamma hood	Single HEPA filter	Yes. Weekly pressure gauge check, and annual DOP test.	Radionuclides & Laboratory Chemicals*
	RAL Canopy Hood	Single HEPA filter	Yes. Weekly pressure gauge check, and annual DOP test.	Radionuclides
JN-3	Vault Exhaust	Rough and dual HEPA filters	Yes. Weekly pressure gauge check, and annual DOP test.	Radionuclides

CAM - continuous air monitor; continuously samples and measures the levels of airborne radioactive materials, equivalent to continuous emission monitor (CEM)
DOP test - Dioctyl Phthalate Testing; efficiency must be 99.95% or higher per BCLDP Health Physics Operating Procedures
RAL - Radioanalytical Laboratory
* There are only a few grams of chemicals (non-radioactive) used daily in the BCLDP Radioanalytical Laboratory.

U.S. Environmental Protection Agency CY 1994 NESHAP Compliance Correspondance

For Review and Approval

	Name	Initials	Date
Originator	E. Swindall		3-28-95
Concurrence	C. Jensen		3-29-95
	S. Kirk		3-28-95
Approved	S. Layendecker		3-29-95

SENT VIA: US Mail

No. 3.3

Internal Distribution

S Layendecker
F Hood
C Jensen
E Castleberry
G Kirsch
E Swindall
Prj. Records (2)

March 28, 1995

Mr. Mike Murphy
Radiation Program, Region 5
U.S. Environmental Protection Agency
77 West Jackson Blvd.
Chicago, IL 60604-3507

SUBJECT: 40 CFR 61 Subpart I Compliance
and Reporting Status for CY 1994

Dear Mr. Murphy:

I am writing to inform you that the Battelle Memorial Institute (BMI) has reviewed the requirements for compliance and reporting under Code of Federal Regulations Title 40 Part 61 Subpart I. This review covered use of radioactive materials under U.S. Nuclear Regulatory Commission License SNM-7, Docket No. 070-00008, at its Columbus, Ohio and West Jefferson, Ohio facilities during calendar year 1994 (CY 1994).

The BMI has evaluated its radionuclide emissions using the compliance procedures of Section 61.103(a) and has found its calculated emissions for CY 1994 were significantly less than 10% of the dose standard of Section 61.102 for both all radioactive materials and radio-iodine categories at each of its sites. Since the calculated dose for CY 1994 was less than the requirement for the dose standard and the reporting requirement, BMI is both in compliance with Subpart I and is exempt from the reporting requirements of Section 61.104(a). Records of this evaluation are being maintained at our main offices in Columbus, Ohio as required by Section 61.105.

If you need any further information or have any questions, please do not hesitate to contact Craig Jensen of my staff at (614) 424-5170.

Sincerely,

Stephen J. Layendecker
BMI Radiation Safety Officer

SJL:srb

Layendecker*EPACOMPL.LTR

Tables of Chemical Data

- Site Chemical Inventory
- Radioanalytical Laboratory Wastewater

TABLE A: RADIOANALYTICAL LABORATORY INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Acetic Acid, Glacial	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	1 gal
Acetone	Ashland P.O. Box 2219 Columbus, OH 43216	(800)274-5263	• JN-2 Rad Lab • Flam Storage Cabinet	
Alconox	Alconox, Inc 215 Park Ave. S. New York, NY 10003	(212)473-1300	JN-2 Rad Lab	
Aliquat 336	Aldrich Chemical Co. P.O. Box 355 Milwaukee, WI 53201	(414)273-3850	Flam Storage Cabinet	
Alizarin 12277-7	Aldrich Chemical Co. P.O. Box 355 Milwaukee, WI 53201	(414)273-3850	JN-2 Rad Lab	
Aluminum Nitrate Reagent (ACS) 644	GFS Chemicals P.O. Box 245 Powell, OH 43065	(800)858-9682	JN-2 Rad Lab	
Ammonium Chloride 0660-1	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	
Ammonium Hydroxide 9721-03	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	
Ammonium Nitrate 0729	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	
Ammonium Oxalate (Crystals) 3452	Mallinckrodt, Inc. Sol. Science Products Div P.O. Box M Paris, KY 40361	(314)982-5000 (800)354-2050	JN-2 Rad Lab	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE A: RADIOANALYTICAL LABORATORY INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Ammonium Oxalate (Monohydrate) 221716	Aldrich Chemical Co. P.O. Box 355 Milwaukee, WI 53201	(414)273-3850	JN-2 Rad Lab	
Ammonium Sulfate 1-0792	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	
Ammonium Sulfide	Mallinckrodt, Inc. Sol. Science Products Div P.O. Box M Paris, KY 40361	(314)982-5000	JN-2 Rad Lab	
Antifreeze & Summer Coolant NAPA *	Wyandott Chem Corp. Wyandott, MI 38192		JN-2 Rad Lab	
Barium Nitrate 93-5625	Strem Chemicals, Inc. 2 Mulliken Way Newburyport, MA 01950-4098	(508)462-3191	JN-2 Rad Lab	
Bismuth (III) Nitrate Pentahydrate 25415-0	Aldrich Chemical Co. P.O. Box 355 Milwaukee, WI 53201		JN-2 Rad Lab	
Boric Acid Bx-0865	Em Science 480 Democrat Road Gibbstown, NJ 08027	(609)354-9200	JN-2 Rad Lab	
Buffer Solution 4.0 34170-106	VWR Scientific West Chester, PA		JN-2 Rad Lab	
Buffer Solution 7.0 34170-115	VWR Scientific West Chester, PA		JN-2 Rad Lab	
Buffer Solution 10.0 34170-124	VWR Scientific West Chester, PA		JN-2 Rad Lab	
Calcium Carbonate Powder 1288-1	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE A: RADIOANALYTICAL LABORATORY INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Calcium Nitrate 99% 100	Alfa Products 152 Andover St. Danvers, MA 01923		JN-2 Rad Lab	
(Carboxymethyl) Imino Bis (ethylenenitrilo)-tetra-acetic acid	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	
Cerous Nitrate C-254	Fisher Scientific Chemical Div. 1 Reagent Lane Fairlawn, NJ 07410	(201)796-7100	JN-2 Rad Lab	
Charcoal Starter *	Reckitt & Colman, Inc. Wayne, NJ 07474		Flam Storage Cabinet	
Chlorothene (R_n Sm_n Solvent)	Dow Chemical USA Midland, MI 48674	(517)636-4400	Flam Storage Cabinet	
Cinnasorb (activator) 4506-03	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab Mercury Spill Kit	
Cinnasorb (base) 4505-04	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab Mercury Spill Kit	
Drierite (CaSo)	W.A. Hammond Drierite Co. P.O. Box 460 Xenia, OH 45385	(513)376-7927	JN-2 Rad Lab	
DuoSeal Pump Oil 1407K-15 *	Sargent, Welch Scientific Co. 7300 N. Linder Ave. Skokie, IL		JN-2 Rad Lab	
Ethyl Alcohol	Sigma Chemical Co. P.O. Box 14508 St. Louis, MO 63178	(314)771-5765	JN-2 Rad Lab Flam Storage Cabinet	
Ethylene-diamine Tetracetic Acid 8993-1 (EDTA)	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE A: RADIOANALYTICAL LABORATORY INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Europium (III) Nitrate Hexahydrate 25406-I	Aldrich Chemical Co. P.O. Box 355 Milwaukee, WI 53201		JN-2 Rad Lab	
Ferric Nitrate 9-hydrate	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	
Ferric Chloride (lump) I-88 74165	Fisher Scientific Chemical Div. 1 Reagent Lane Fairlawn, NJ 07410	(201)796-7100	JN-2 Rad Lab	
General Purpose Sealant *	Dow Corning Corp. Midland, MI 48640		JN-2 Rad Lab	
Glow-lene Cream Cleanser 74322	Hysant Corp. 4309 S. Morgan St. Chicago, IL 60609	(800)752-7869	JN-2 Rad Lab	
Hazorb (acids)	Lab Safety Supply P.O. Box 1368 Jonesville, WI 53547	(800)356-0787	JN-2 Rad Lab Spill Kit	
Hazorb (caustics)	Lab Safety Supply P.O. Box 1368 Jonesville, WI 53547	(800)356-0787	JN-2 Rad Lab Spill Kit	
High Vacuum Grease *	Dow Corning Corp. Midland, MI 48640		JN-2 Rad Lab	
Hionic-Fluor	Packard Instrument Co. 2200 Warrenville Rd. Downers Grove, IL 60515	(800)323-5891	JN-2 Rad Lab	
Husky 430 Cream Cleanser	Canberra Corp. 3610 Holland Sylvania Rd. Toledo, OH 43615	(419)841-6616	JN-2 Rad Lab	
Hydrobromic Acid 47-49% 0160-01	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE A: RADIOANALYTICAL LABORATORY INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Hydrocholoric Acid VW3124-8	VWR Scientific West Chester, PA		JN-2 Rad Lab	
Hydrocholoric Acid 9535-03	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	5 gal
Hydrofluoric Acid (48-51%) 9560-01	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	1 gal
Hydrogen Peroxide 30% 2186-01	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	1 gal
Insta-Gel	Packard Instrument Co. 2200 Warrenville Rd. Downers Grove, IL 60515	(800)323-5891	JN-2 Rad Lab	
Insta-Gel XF	Packard Instrument Co. 2200 Warrenville Rd. Downers Grove, IL 60515	(800)323-5891	JN-2 Rad Lab	
Isopropyl Alcohol	Zep Mfg. Co P.O. Box 2015 Atlanta, GA 30301	(404)352-1680	JN-2 Rad Lab	
Krylon - Banner Red 2108	Borden, Inc. Columbus, OH 43215		Flam Storage Cabinet	
Krylon - Crystal Clear 1302	Borden, Inc. Columbus, OH 43215		Flam Storage Cabinet	
Krylon - Electronic Crystal Clear 1303	Borden, Inc. Columbus, OH 43215		Flam Storage Cabinet	
Krylon - Flat White 1502	Borden, Inc. Columbus, OH 43215		Flam Storage Cabinet	
Krylon - Glossy Black 1601	Borden, Inc. Columbus, OH 43215		Flam Storage Cabinet	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE A: RADIOANALYTICAL LABORATORY INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Krylon - Glossy White 1501	Borden, Inc. Columbus, OH 43215		Flam Storage Cabinet	
Krylon - Red Orange 3101	Borden, Inc. Columbus, OH 43215		Flam Storage Cabinet	
Krylon - Ultra Flat Black 1602	Borden, Inc. Columbus, OH 43215		Flam Storage Cabinet	
Lead Nitrate 2322-01	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	
Mercury	Adrow Chemical Co. 2 Lines Ave. Wanaque, NJ 07465	(201)337-3183	JN-2 Rad Lab	
Methyl Orange	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	
Methyltrioctyl Ammonium Chloride 1368885	Eastman Kodak Co. 343 State St. Rochester, NY 14650	(716)722-5151 (800)225-5352	JN-2 Rad Lab	
Motor Oil Non-detergent SAE 10W *	Mobil Oil Corp. New York, NY 10017		JN-2 Rad Lab	
Motor Oil Non-detergent SAE 10W *	Kendall Refining Co. Witco Chemical Corp. Bradford, PA 16701		JN-2 Rad Lab	
Neutra Cit-2 Caustic Neutralizer 4470-05	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab Spill Kit	
NeutraSorb Acid Neutralizer 4456-05	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab Spill Kit	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE A: RADIOANALYTICAL LABORATORY INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Nitric Acid 69-71% 9601-03	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	5 gal
Nitric Acid 90% (fuming)	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	
Nitric Acid 90% (fuming)	Fisher Scientific Chemical Div. 1 Reagent Lane Fairlawn, NJ 07410	(201)796-7100	JN-2 Rad Lab	
Nitrous Oxide Refrigerated Liquid	Airco 575 Mountain Ave. Murray Hill, NJ 07974	(800)424-9300	JN-2 Rad Lab	4 (196ℓ) dewars
Oxalic Acid, Dihydrate	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	
Oxalic Acid, Anhydrous 99% Gold Label	Aldrich Chemical Co P.O. Box 355 Milwaukee, WI 53201		JN-2 Rad Lab	
P-10 Gas	Airco 575 Mountain Ave Murray Hill, NJ 07974	(800)424-9300	JN-2 Rad Lab	(5) 2200 psig cylinders
Palladium Chloride PX0015	EM Science 480 Democrat Rd. Gibbstown, NJ 08027	(609)354-9200	JN-2 Rad Lab	
Phosphoric Acid 3-0260	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	1 gal
Pliobond Industrial Adhesive	W.J. Ruscoe Co. 483 Kenmore Blvd. Akron, OH 44301	(216)253-8148	Flam Storage Cabinet	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE A: RADIOANALYTICAL LABORATORY INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
40 Plus 61601	J.T. Holcomb Mfg P.O. Box 408 Wooster, OH 44691	(216)391-8300	• JN-2 Rad Lab • Flam Storage Cabinet	
Pneumatic Lubricating Oil SAE 10 AD220 *	Gast Mfg Corp P.O. Box 97 Benton Harbor, MI 49022		JN-2 Rad Lab	
Propane Fuel TX40119	Bernz-O-Matic Rochester, NY	(716)798-4949	Flam Storage Cabinet	
Redisorb-Mercury Vapor Absorbent 4455-05	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab Mercury Spill Kit	
Resin - Anion Exchange AG-1-X2	Bio-Rad Laboratories 2000 Alfred Nobel Dr. Hercules, CA 94547	(510)232-7000	JN-2 Rad Lab	
Resin - Anion Exchange AG-1-X4	Bio-Rad Laboratories 2000 Alfred Nobel Dr. Hercules, CA 94547	(510)232-7000	JN-2 Rad Lab	
Resin - Cation Exchange AG-50W-X4	Bio-Rad Laboratories 2000 Alfred Nobel Dr. Hercules, CA 94547	(510)232-7000	JN-2 Rad Lab	
Resin - Cation Exchange AG-50W-X8	Bio-Rad Laboratories 2000 Alfred Nobel Dr. Hercules, CA 94547	(510)232-7000	JN-2 Rad Lab	
Rubber Cement *	Stanford Comp. Bellwood, IL 60104		Flam Storage Cabinet	
Ruby's Stainless Steel Soldering Flux *	The Ruby Chem. Co. Columbus, OH		JN-2 Rad Lab	
Sand-Washed & Dried 7062	Mallinckrodt, Inc. Sol. Science Products Div P.O. Box M Paris, KY 40361	(314)982-5000	JN-2 Rad Lab	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE A: RADIOANALYTICAL LABORATORY INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Silicon Lubricant 03030 *	CRC Chemicals Warminster, PA 18974		Flam Storage Cabinet	
Silicotungstic Acid A289100	Fisher Scientific Chemical Div. 1 Reagent Lane Fairlawn, NJ 07410	(201)796-7100	JN-2 Rad Lab	
Snoop	Nupro Co. 4800 E. 345th St. Willoughby, OH 44094		JN-2 Rad Lab	
Sodium Carbonate (anhydrous)	Mallinckrodt, Inc. Sol. Science Products Div P.O. Box M Paris, KY 40361	(314)982-5000	JN-2 Rad Lab	
Sodium Carbonate (anhydrous)	Alfa Products Thiskol/ventron Div. 152 Andover St. Danvers, MA 01923	(508)521-6300	JN-2 Rad Lab	
Sodium Chromate 3640	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	
Sodium Chromate Reagent 307592	Alfa Products Thiokol/Ventrol Div 152 Andover St. Danvers, MA 01923	(508)521-6300	JN-2 Rad Lab	
Sodium Chloride 3624-05	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	
Sodium Hydrogen Sulfate Reagent	Alfa Products Thiskol/ventron Div. 152 Andover St. Danvers, MA 01923	(508)521-6300	JN-2 Rad Lab	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE A: RADIOANALYTICAL LABORATORY INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Sodium Hydroxide Pellets 3722-5	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	
Sodium Iodide (crystal) I-3748	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	
Sodium Nitrite Crystalline 1-3780	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	
Sodium Sulfide 9-hydrate 3910-01	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	
Solvsorb Solvent Absorbant 4458-05	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab Spill Kit	
Sodium Sulfite (Anhydrous) 3922-1	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab Spill Kit	
Spray Nine	Knight Oil Co. 251 N. Coric Ave. Johnstown, NY 12095	(518) 762-4591	JN-2 Rad Lab	24 (1 pint)
Spill-X-A	Ansul Fire Protection One Stanton St. Marinette, WI 54143	(715)735-7411 (800)424-9300	JN-2 Rad Lab Spill Kit	
Statnul Anti-Static Solution	Weston Instruments Ink Newark, NJ	(215)257-6531	JN-2 Rad Lab	
Strontium Nitrate 93-3814	Strem Chemicals, Inc. 7 Mulliken Way Newburyport, MA 01950	(508)462-3191	JN-2 Rad Lab	
Strontium Nitrate 5-549	Fisher Scientific 1 Reagent Lane Fairlawn, NJ 07410	(201)796-7100	JN-2 Rad Lab	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE A: RADIOANALYTICAL LABORATORY INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Sulfanilic Acid 24042-7	Aldrich Chemical Co. P.O. Box 355 Milwaukee, WI 53201	(414)273-3850	JN-2 Rad Lab	
Sulfur 3935065	Ashland Chemical, Inc. P.O. Box 2219 Columbus, OH 43216	(800)274-5263 (614)889-3333	JN-2 Rad Lab	
Sulfuric Acid	J.T. Baker, Inc. 222 Red School Lane Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	1 gal
Tel-Tale Silica Gel Desicant (Activated) 04208080237 *	Davison Chem. Co. Baltimore, MD 21203		JN-2 Rad Lab	
Thinner #33	M.J. Daly Co. 38 Elm St. Ludlow, KY 41016	(800)424-9300	Flam Storage Cabinet	
Titlebond Glue *	Franklin Glue Co. Columbus, OH 43207		JN-2 Rad Lab	
1,1,1 Trichloroethane T5470-4	Aldrich Chemical Co. P.O. Box 355 Milwaukee, WI 53201	(414)273-3850	JN-2 Rad Lab	
Triple S Glass Cleaner	Triple S 141 Middlesex Tpke Burlington, MA 01803	(800)228-5635	JN-2 Rad Lab	
Ultma Gold	Packard Instrument Co. 2200 Warrenville Rd. Downers Grove, IL 60515	(800)323-5891	JN-2 Rad Lab	
WD-40	WD-40 Co. San Diego, CA 92110		JN-2 Rad Lab	
Yttrium Nitrate 83103	Alfa Products Thiokol/Ventron Div 152 Andover St. Danvers, MA 01923	(508)521-6300	JN-2 Rad Lab	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE A: RADIOANALYTICAL LABORATORY INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Zep Old Smoky	Zep Mfg. Co. P.O. Box 2015 Atlanta, GA 30301	(800)424-9300	JN-2 Rad Lab	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE B: JANITORIAL SUPPLIES INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
3M A101 Spray Cleaner 61-5000-0314-2	Bldg. Services & Cleaning Products Div. 3M St. Paul, MN 55161	(612)733-1110	JN-1 Janitor Closet	
AM-7 Neutral Cleaner	A&M Maint. 856 McKinley Ave. Columbus, OH 43222	(614)875-5574	JN-1 Janitor Closet Break Trailer JN-2 Rm. 2103	8 (1 gal) 1 (1 gal) 4 (1 gal)
Best Bet-Liquid Cream Cleanser	Betco Corp. 1001 Brown Ave. Toledo, OH 43607	(419)241-2156	JN-3 Rm. 3216 JN-2 Janitor Closet JN-2 2103	15 (1 qt) 1 1
Deep Blue Glass & Window Cleaner 108	Betco Corp. 1001 Brown Ave. Toledo, OH 43607	(419)241-2156	JN-1 Rm. 1108 JN-3 Rm. 3216 Breaktrailer	1 gal
Gleme Glass Cleaner	Claire Mfg. Co Addison, IL 60101	(708)543-7600 (800)228-5635	JN-1 Janitor Closet	
Hardwax Furniture Polish	Claire Mfg. Co. Addison, IL 60101	(700)543-7600 (800)228-5635	Breaktrailer	
Kling Hospital Type Disinfect. Cleaner	Betco Corp. 1001 Brown Ave. Toledo, OH 43607	(419)241-2156	Breaktrailer JN-2 Janitor Closet JN-1 Janitor Closet JN-3 Rm. 3216	32 (1 qt)
Non-Ammoniated Stripper (heavy duty)	A&M Maint. 856 McKinley Ave. Columbus, OH 43222	(614)875-5574	JN-2 Janitor Closet JN-1 Janitor Closet Breaktrailer JN-3 Rm. 3216 JN-2 Rm. 2103	5 (1 gal) 1 (1 gal) 1 (1 gal) 2 (1 gal)
Phisohex *	Winthrop Laboratories Div. of Sterling Drug, Inc. New York, NY 10016		JN-1 Rm. 1105	
Spray Nine	Knight Oil Corp. Johnstown, NY 12095	(518)762-4591	JN-1 JN-2 JN-3	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE B: JANITORIAL SUPPLIES INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Super Poly Acrylic Polymer Floor Finish	A&M Maint. 856 McKinley Ave. Columbus, OH 43222	(614)875-5574	JN1 Rm 1105H JN1 Rm 1108 JN2 Rm 2103	1 (5 gal) 4 (1 gal) 2 (1 gal)
Winning Hands Lotion Hand Cleaner	Betco Corp. 1001 Brown Ave. Toledo, OH 43607	(419)241-2156	JN-2 2103	2 (1 gal)
Zep Old Smoky	Zep Mfg. Co. P.O. Box 2015 Atlanta, GA 30301	(404)352-1880	JN-3	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE C: ELECTRONIC SERVICES LABORATORY INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Adhesive Sealent 271-131	Loctite Corp. Newington, CT	(216)475-3600	JN-2, Rm 2119	
Aero Duster #MS-222	Miller Stephenson 6348 Oakton St. Morton Grove, IL 60053	(705)966-2022	JN-2, Rm 2119	
Afta Spot Remover * 4000	Guardsman Chemicals, Inc. Grand Rapids, MI 49508		JN-2, Rm 2119	
Alcohol Denatured *	Shipp Chem. Co. Houston, TX		JN-2, Rm 2119	
Alconox Detergent	Alconox, Inc. New York, NY 10003	(212)473-1300	JN-2, Rm 2119	
Ammoniated Glass Cleaner #278722	Fuller Brush Co. Great Bend, KA 67530	(316)792-1711	JN-2, Rm 2119	
Anderol Gun Oil *	Birchwood Casey Eden Prairie, MN 55343		JN-2, Rm 2119	
Anti-Static Spray	SPC Technology Box 66175 Chicago, IL 60666	(312)907-5181	JN-2, Rm 2119	
Apiezon Grease *	Apiezon Products Ltd 8 York Road London SE1		JN-2, Rm 2119	
Aquadag Colloid Graphite in Water	Acheson Colloids Co. Port Huron, MI	(313)984-5581	JN-2, Rm 2119	
Chlorothene R Sm Solvent	Chemcentral 12 Standen Dr. Hamilton, OH 45015	(513)874-7766	JN-2, Rm 2119	1 gal
DEK Insect Bomb	State Chemical Cleveland, OH	(216)861-7114	JN-2, Rm 2119	
Dermex Hand Cream *	National Chemsearch Stouts Lane Monmouth Junction, NJ		JN-2, Rm 2119	

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TABLE C: ELECTRONIC SERVICES LABORATORY INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
DL Hand Cleaner 01-013 *	DL Group/Banite, Inc. Buffalo, NY 14204	(800)354-7687	JN-2, Rm 2119	
Dricrite	WA Hammond Drierite Co Xenia, OH	(513)376-2927	JN-2, Rm 2119	12 (1 lb)
Dry Graphite Film Lubricant #192240	Miracle Power Products Corp. Cleveland, OH 44109	(216)741-1388	JN-2, Rm 2119	
Duo Seal Pump Oil #291770	Sargent Welch Scientific Co. Skokie, IL	(312)677-0600	JN-2, Rm 2119	1 (1 gal) 2 (1 qt)
E-Poxy (Hardner) TPX-5 *	Woodhill Permatex/Loctite 18731 Cranwood Parkway Cleveland, OH 44128	(216)475-3600	JN-2, Rm 2119	
E-Poxy-5 (Resin) #172181 TPX-5 *	Woodhill Permatex/Loctite 18731 Cranwood Parkway Cleveland, OH 44128	(216)475-3600	JN-2, Rm 2119	
Ethyl Alcohol 200 proof	Aaper Alcohol & Chemical Co. 11 Isaac Shelby Dr. Shelbyville, KY 40066	(502)633-0650 (800)424-9300	JN-2, Rm 2119	
Freon T-P 35 Solvent	Miller-Stephenson Chem. 6348 Oakton St. Morton Grove, IL 60053	(705)966-2022	JN-2, Rm 2119	
General Sealant * #1677535-0481	Dow Corning Corp Midland, MI		JN-2, Rm 2119	
Glyptal Red Enamel 1201 #199310	General Electric Schenectady 6, NY	(617)884-6918	JN-2, Rm 2119	
High Vacuum Grease *	Dow Corning Corp. Midland, MI		JN-2, Rm 2119	
High Gloss Black * #199580	Rust-Oleum Corp Evanston, IL 60204		JN-2, Rm 2119	
Home Oiler *	Sohio Laboratories Cleveland, OH		JN-2, Rm 2119	

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TABLE C: ELECTRONIC SERVICES LABORATORY INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Insect Spray #15507-316	A&M Maintenance Supply 445 Commerce Sq Columbus, OH	(614)272-7520	JN-2, Rm 2119	
Krylon Spray Paint Beige 2504	Borden, Inc. Dept. CP New York, NY 10017	(216)292-7400 (800)247-3266	JN-2, Rm 2119	
Krylon Spray Paint Bright Silver 1401	Borden, Inc. Dept. CP New York, NY 10017	(216)292-7400 (800)247-3266	JN-2, Rm 2119	
Krylon Spray Paint Cherry Red Enamel 2101	Borden, Inc. Dept. CP New York, NY 10017	(216)292-7400 (800)247-3266	JN-2, Rm 2119	
Krylon Spray Paint Crystal Clear 1302	Borden, Inc. Dept. CP New York, NY 10017	(216)292-7400 (800)247-3266	JN-2, Rm 2119	
Krylon Spray Paint Dove Gray 1605	Borden, Inc. Dept. CP New York, NY 10017	(216)292-7400 (800)247-3266	JN-2, Rm 2119	
Krylon Spray Paint Engine Color (Ford Red) 2106	Borden, Inc. Dept. CP New York, NY 10017	(216)292-7400 (800)247-3266	JN-2, Rm 2119	
Krylon Spray Paint Shadow Gray Enamel 1604	Borden, Inc. Dept. CP New York, NY 10017	(216)292-7400 (800)247-3266	JN-2, Rm 2119	
Krylon Spray Paint Ultra Flat Black 1602	Borden, Inc. Dept. CP New York, NY 10017	(216)292-7400 (800)247-3266	JN-2, Rm 2119	
Liquid Propane	Eberline Instrument Corp. Sante Fe, NM 81501	(505)471-3232 (800)678-7088	JN-2, Rm 2119	24 (6 oz)
Lubricating Oil 4020 *	Honeywell Fort Washington, PA		JN-2, Rm 2119	

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TABLE C: ELECTRONIC SERVICES LABORATORY INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Lubricating Oil B-1349 *	Minneapolis-Honeywell Brown Instruments Div. Philadelphia, PA		JN-2, Rm 2119	
Lubriko Grease	Master Lub. Co. Philadelphia, PA	(215)389-2680	JN-2, Rm 2119	
Lubriplate 930-AA 09601	Fiske Brothers Refining Co. Toledo, OH 43605	(419)691-2491	JN-2, Rm 2119	
Metal Cleaner Paste *	Amway Corp. Ada, MI		JN-2, Rm 2119	
Micro Liquid Cleaner	International Product Corp P.O. Box 118 Trinton, NJ	(609)394-5480	JN-2, Rm 21	
Mineral Spirits - Solvent Stoddard R-66	BP Oil Co. 200 Public Square Cleveland, OH 44114	(800)362-8059	JN-2, Rm 2119	1 gal
Mineral Oil * 073	Rexal Drug Co. St. Louis, MO		JN-2, Rm 2119	
Motor Oil #291650	Kendall Co Refining Co. Bradford, PA 16701	(814)368-6111	JN-2, Rm 2119	4 (1 qt)
Optical Couplant Q2-3067	Dow Corning Corp. Midland, MI	(517)496-5900 (517)496-6000	JN-2, Rm 2119	
Optical Grease *	Tracerlab Inc. 2030 Wright Ave. Richmond 3, CA		JN-2, Rm 2119	
Penetrating Oil * (Blue Ribbon)	Int'l Metal Polish Co. Indianapolis, IN		JN-2, Rm 2119	
Pliobond - General Purpose * Adhesive	The Ashland/Goodyear Tire & Rubber Co. Akron, OH 44316	(216)796-2121 (614)889-4612	JN-2, Rm 2119	
40-Plus Spray #192248	J.J. Holcomb Mfg. Co. 4500 Euclid Ave Cleveland, OH 44103	(216)391-8300	JN-2, Rm 2119	

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TABLE C: ELECTRONIC SERVICES LABORATORY INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Quick Freeze MS-240	Miller Stephenson Chem Co. 6346 Oakton St. Morton Grove, IL 60053	(705)966-2022	JN-2, Rm 2119	
Resin Adhesive Two Part Compound *	Smooth-On Inc. 1000 Ralley Rd. Gillette, NJ 07933	(900)647-3800	JN-2, Rm 2119	
Slidewire Cleaner 5030-3605	Hewlett Packard San Diego, CA 92127	(619)487-4100 (800)752-0900	JN-2, Rm 2119	
Slidewire Lubricant	Hewlett Packard San Diego, CA 92127	(619)487-4100	JN-2, Rm 2119	
Snoop 42012 Leak Detector	Nupro Co. 4800 E 345th St. Willoughby, OH 44094	(216)951-7100	JN-2, Rm 2119	
Sprasolvo Penetrating Oil 723	A.W. Chesterton Co. Stoneham, MA	(617)438-7000	JN-2, Rm 2119	
Spray Nine	Knight Oil Corp. Johnstown, NY 12095	(518)762-4591	JN-2, Rm 2119	
Sprayon-Vinyl Strippable Protective Coating 322	Sprayon Products, Inc. Bedford Heights, OH	(216)292-7400	JN-2, Rm 2119	
Stopcock Grease Silicone Lubricant	Dow Corning Corp. Midland, MI	(517)496-5900	JN-2, Rm 2119	
Super 77 Spray Adhesive	3M Adhesives, Coatings & Sealers Div. St. Paul, MN 55144	(612)733-1110	JN-2, Rm 2119	5 (17 oz)
Thermal Compound 120-2	Wakefield Engineering, Inc. Wakefield, MA 01880	(617)245-5900	JN-2, Rm 2119	
Thinner #33	M.J. Daly Co. 38 Elm St. Ludlow, KY 41016	(800)424-9300	JN-2, Rm 2119	

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TABLE C: ELECTRONIC SERVICES LABORATORY INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Three-in-one Household Oil	Boyle-Midway, Inc. New York, NY 10017	(201)276-3900	JN-2, Rm 2119	
Tide Laundry Detergent*	Proctor & Gamble Cincinnati, OH 45202		JN-2, Rm 2119	
Toluene #111440	Chemcentral 12 Standen Dr. Hamilton, OH 45013	(800)424-9300	JN-2, Rm 2119	1 gal
Trichlorethylene #111490	PPG Industries, Inc. Pittsburgh, PA 15272	(304)843-1300	JN-2, Rm 2119	1 gal
Vaseline Petroleum Jelly 5-4303 *	Cheesebrough Ponds, Inc. New York, NY		JN-2, Rm 2119	
Vitralite Enamel #199610	Pratt & Lambert, Inc. Buffalo, NY 14240	(716)873-6000	JN-2, Rm 2119	
Wash Plus * #2404	Proctor-Recorder Belt Corp Whitewater, WI 53190	(800)558-9572	JN-2, Rm 2119	
Weld-On #3 Acrylic Plastic Cement	Industrial Polychemical Service P.O. Box 471 Gardena, CA 90247	(310)366-3300	JN-2, Rm 2119	
Yellow 77-Wire Pulling Lubricant 31-356	Ideal Mfg. Sycamore, IL	(815)895-5181	JN-2, Rm 2119	

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TABLE D: MACHINE SHOP INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufac-turer's Phone No.	Location	Volume (if total > 1 gal)
Acetylene	Liquid Carbonic Specialty Gas Corp.	(614)443-7687	JN-1 Yard	1 (2,200 lb cylinder)
Acetylene PG-6	Union Carbide Corp Linde Division Danbury, CT 06817	(614)443-4244	JN-1 (Machine Shop)	1 (2,200 lb cylinder)
All Purpose Cement Milky Clear #30818	Oatey Cleveland, OH 44135	(216)267-7100	JN-1	
All 4 Moisture Displacing Lubricant	Crown Industrial Prod. Co. Hebron, IL 60034	(800)766-7655	Flam Storage (Machine Shop)	
Anchorlube G-771	Anchor Chemical Co. 777 Canterbury Rd Westlake, OH 44145	(216)871-1660	JN-1	
Baby Powder *	Johnson & Johnson Newbrunswick, NJ	(800)526-3967	JN-1	
Brake & Parts Cleaner	Loctite Corp./Permatex Automotive & Consumer Group Cleveland, OH	(216)475-3600	Flam Storage (Machine Shop)	
Charcoal Starter *	Red Oil Marketing Corp. Minneapolis, MN 55440	N/L	Flam Storage (Machine Shop)	
Clear Finish Satin 38 H17	Pratt & Lambert P.O. Box 22 Buffalo, NY 14240	(716)873-6000	Flam Storage (Machine Shop)	1
Coal Tar Emulsion Sealer	The Brewer Co. 1354 U.S. Hwy. 50 Milford, OH 45150	(513)576-6300	JN-2 High Bay	5 gal
Delux Paint 96-Y-67633 Shale Gray *	DuPont Wilmington, DE 19898		Flam Storage (Machine Shop)	
Dioctyl Phthalate (DOP)	Aldrich Chemical Co. P.O. Box 355 Milwaukee, WI 53201	(414)273-3850	Flam Storage (Machine Shop)	1

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TABLE D: MACHINE SHOP INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufac-turer's Phone No.	Location	Volume (if total > 1 gal)
Dry Moly Lubricant 6080	Crown Industrial Prod. Co. Hebron, IL 60034	(800)766-7655	Flam Storage (Machine Shop)	
Ethyl Alcohol	DuPont NEN Research Products 549 Albany St. Boston, MA 02118	(800)441-3637	• Flam Storage (Machine Shop)	5 gal
Floor-Dry	Eagle Pitcher Minerals Floor Dry Dept. Reno NV 89510	(702)322-3331	JN-2 High Bay	4 (25 lb)
Flying Insect Killer (Insecticide Spray)	A&M Maintenance & Supply, Inc. 288 E. Long St. Columbus, OH 43215	(614)875-5574	JN-1	
Gasoline (Unleaded)	BP Oil Co. 200 Public Square Cleveland, OH 44114	(216)586-8300	Flam Storage (Yard)	2 gal
Gear Oil Lo-23 Rev. 9-61	Bodine Electric Co. Chicago, IL	(312)478-3515	Flam Storage (Machine Shop)	5 gal
Gear Lubricant 85W-140 Model 62143	Dayton Electric Mfg. Co. Chicago, IL 60648	(414)567-7523	Flam Storage (Machine Shop)	1
Gold End Paste 900 Product #000909	A.W. Chesterton Co. Stoneham, MA 02180-2999	(617)438-7000	JN-1	
Handy Flux *	Handy & Harman 850 Third Ave. New York, NY 10022	(212)752-3400	JN-1	
Industrial Enamels 769 Damp Proof Red Primer	Rust-Oleum Corp. Evanston, IL 60204	(708)367-7700	Flam Storage (Machine Shop)	1 gal
Industrial Enamels 634 High Gloss Black	Rust-Oleum Corp. 11 Hawthorne Parkway Vernon Hills, IL 60061	(708)367-7700	Flam Storage (Machine Shop)	2 gal

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TABLE D: MACHINE SHOP INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufac-turer's Phone No.	Location	Volume (if total > 1 gal)
Interior Life Enamel Ultra Gloss White E7 (Vitralite)	Pratt & Lambert P.O. Box 22 Buffalo, NY 14240	(716)873-6060	Flam Storage (Machine Shop)	1 1/2 gal
Krylon Spray Paint Banner Red 2108	Borden, Inc. Dept. HPPG - Krylon Columbus, OH 43215	(216)292-7400 (800)247-3266	Flam Storage (Machine Shop)	
Krylon Spray Paint Bright Yellow 1804	Borden, Inc. Dept. HPPG - Krylon Columbus, OH 43215	(216)292-7400 (800)247-3266	Flam Storage (Machine Shop)	
Krylon Spray Paint Crystal Clear 1302	Borden, Inc. Dept. HPPG - Krylon Columbus, OH 43215	(216)292-7400 (800)247-3266	Flam Storage (Machine Shop)	15 (11 oz)
Krylon Spray Paint Ford Red 2106	Borden, Inc. Dept HPPG - Krylon Columbus, OH 43215	(216)292-7400 (800)247-3266	Flam Storage (Machine Shop)	
Krylon Spray Paint Glowing Green 3106 (Fluorescent)	Borden, Inc. Dept. HPPG Columbus, OH 43215	(216)292-7400 (800)247-3266	Flam Storage (Machine Shop)	
Krylon Spray Paint Matte Finish 1311	Borden, Inc. Dept. HPPG - Krylon Columbus, OH 43215	(216)292-7400 (800)247-3266	Flam Storage (Machine Shop)	
Krylon Spray Paint Ruddy Brown 1357 Primer	Borden, Inc. Dept. HPPG - Krylon Columbus, OH 43215	(216)292-7400 (800)247-3266	Flam Storage (Machine Shop)	
Krylon Spray Paint Ultra Flat Black 1602	Borden, Inc. Dept. HPPG - Krylon Columbus, OH 43215	(216)292-7400 (800)247-3266	Flam Storage (Machine Shop)	
Lemon Fresh Joy *	Proctor & Gamble Cincinnati, OH 45202	(800)543-0485	JN-1	
Lens Cleaning Station	Bausch & Lomb 1400 N. Goodman St	(800)553-5340	JN-1	

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TABLE D: MACHINE SHOP INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufac-turer's Phone No.	Location	Volume (if total > 1 gal)
Lexite	National Chem Service Corp. Dallas, TX	(800)527-9921	Flam Storage (Machine Shop)	
Liquid Propane	Eberline Inst. Corp. Santa Fe, NM 81501	(505)471-3232	Flam Storage (Machine Shop)	
Lubriplate No. 930-AA Grease Part No. 09601	Lubriplate Div. Fiske Bros. Refining Co. Toledo, OH 43605	(419)691-2491	Flam Storage (Machine Shop)	
Lubriplate No 130-AA Grease Part No. 04495	Lubriplate Div. Fiske Bros. Refining Co. Toledo, OH 43605	(419)691-2491	Flam Storage (Machine Shop)	
Marfak O	Texaco, Inc. White Plains, NY	(914)253-4000	Flam Storage (Machine Shop)	
Marine-Strip Heavy Duty Paint Remover	James B. Day & Co. Carpentersville IL 60110	(708)428-2651	Flam Storage (Machine Shop)	
Multi-Purpose Grease *	Parker Automotive Plews Division Minneapolis, MN 55416		Flam Storage (Machine Shop)	
Never Seez Anti Seez & Lubricating Compound NSB T-8	Bostic Chemical Group Boston St. Middleton, MA 01949	(508)777-0100	Flam Storage (Machine Shop)	
Nissen Metal Marker	John P. Nissen Jr., Co. 2544 Fairhill Ave Glenside, PA 19038	(215)886-2025 (215)884-8213	JN-1	
No. 2 Fuel Oil	Marathon Oil Co. 539 South Main St. Findlay, OH 45840	(800)424-9300	JN-1 Yard	250 gal
NoKorode Soldering Paste *	The M.W. Dunton Co. Providence, RI 020901		JN-1	
Oxygen PG-8	Union Carbide Corp. Linde Division Danbury, CT 06817	(614)443-4244	JN-1 (Machine Shop)	1 (2,200 lb cylinder)

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TABLE D: MACHINE SHOP INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufac-turer's Phone No.	Location	Volume (if total > 1 gal)
Palgard Gloss Activator A6371	Pratt & Lambert P.O. Box 22 Buffalo, NY 14240	(716)873-6000	Flam Storage (Machine Shop)	1 gal
Palgard Epoxy Coating White E30016	Pratt & Lambert P.O. Box 22 Buffalo, NY 14240	(716)873-6000	Flam Storage (Machine Shop)	1 gal
Paste Wax *	S.C. Johnson & Son Inc. Racine, WI		JN-1	
Peak Antifreeze & Coolant *	Northern Petro Chemical Co. 2223 Dodge St. Omaha, NE 68102		Flam Storage (Machine Shop)	
Pennzoil Motor Oil * w/Z-7 SAE 30	Penzoil Co. Oil City, PA 16301		Flam Storage (Machine Shop)	
Pipe Joint Compound	Permatex Co. Inc./Loctite Kansas City, KS 66115	(216)663-3011 (216)475-3600	JN-1	
40 plus	J.I. Holcomb 4500 Euclid Ave. Cleveland, OH 44103	(216)391-8300	Flam Storage (Machine Shop)	
Premium Brake Fluid *	Wagner Div. Cooper Ind Inc 100 Misty Lang Parsippany, NJ 07054		Flam Storage (Machine Shop)	1
Propane Fuel Cylinder	Benz O'Matic Corp. Medina, NY 14103	(716)798-4949	JN-1	
Propane - LPG	Liquid Carbonic Chicato, IL 60603	(312)935-4747 (614)443-7687	JN-2 High Bay	25 lb
Quickrete Concrete Mix *	Quickrete Companies Atlanta, GA 30345		JN-2 1st Floor East Stairwell	100 lb
Rust Veto Spray	Aerosol Products Div. EFHoughton & Co. Philadelphia, PA 19133	(800)424-9300	Flam Storage (Machine Shop)	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE D: MACHINE SHOP INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufac-turer's Phone No.	Location	Volume (if total > 1 gal)
Rust-O-Thane 9410 clear	Rust-Oleum Corp. 11 Hawthorne Parkway Vernon Hills, IL 60061	(708)367-7700	Flam Storage (Machine Shop)	1 gal
Rust-Oleum * Federal Safety White	Rust-Oleum Corp. 11 Hawthorne Parkway Vernon Hills, IL 60061	(708)367-7700	Flam Storage (Machine Shop)	1 gal
Solder *	Kester Solder Co. Division of Litton Industries Chicago, IL		JN-1	
Spray-On * 324 color code & refinishing enamel	Sherwin Williams Co. 840 W Goodale Columbus, OH 43214	(614)221-5020	Flam Storage (Machine Shop)	
Stainless Steel Soldering Flux *	The Ruby Chemical Co. Columbus, OH		JN-1	
Steel Blue Layout Fluid DX-100	Dykem Co. 8501 Delport Dr. St. Louis, MO 63114	(31)423-0100	Flam Storage (Machine Shop)	
Super Filter Adhesive #418	Research Products Corp. Madison, WI 53701	(608)257-8801	Flam Storage (Machine Shop)	
Tap Free *	Winfield Brooks Co., Inc. Woburn, MA 01801	(617)933-5300	JN-1 (Machine Shop)	
Tap Magic *	Steco Corp. Little Rock, AK		JN-1	
Thinning Oil 633	Rust-Oleum Corp. Evanston, IL 60204	(708)367-7700	Flam Storage (Machine Shop)	1 gal
Trichloroethylene	PPG Industries Pittsburgh, PA 15272	(304)843-1300		5 gal
Unocal Unax Rx32 04611	Unocal Refining & Marketing Div. Union Oil Co. of CA 1201 W. 5th St. Los Angeles, CA 90017	(800)356-3129	JN-1 Yard	5 (55 gal)

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE D: MACHINE SHOP INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufac-turer's Phone No.	Location	Volume (if total > 1 gal)
Vapex Summer Yellow Z 1691	Pratt & Lambert P.O. Box 22 Buffalo, NY 14240	(716)873-6000	Flam Storage (Machine Shop)	1 gal
Vinyl Strip Protective Coating 322	Sherwin Williams Co. 840 W. Goodale Columbus, OH 43214	(614)221-5020	Flam Storage (Machine Shop)	

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TABLE E: OFFICE SUPPLIES INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Elmers Wonder Bond Plus *	Borden, Inc. Dept. CP Columbus, OH 43215		JN-2	
Film Remover	Xerox Corp. Rochester, NY	(716)423-5090	JN-2 2nd Floor Hallway (east)	
Gleme Glass Cleaner	Clair Mfg. Co. Addison, IL. 60101	(708)543-7600	JN-2	
Silican Fuser Oil	Xerox Corp. Rochester, NY	(716)423-5090	JN-2 2nd Floor Hallway (east)	
Zep Old Smoky	Zep Mfg. Co. Exec. Offices Atlanta, GA 30318	(404)352-1680	JN-3	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE F: HEALTH PHYSICS SUPPLIES INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Aero Duster	Miller-Stevensen 6348 Dakton St. Morton Grove, IL 60053	(708)966-2022	• JN-1 R 1105B • JN-3 Rm 3222 Flam Storage Cabinet	
De-Solv It	Orange Sol Inc. 9 N. Roosevelt St. P.O. Box 306 Chanolez, AZ 85244	(602)961-0975	JN-2 Highbay	1 (55g) drum
Gasoline (Unleaded)	BP Oil Co. 200 Public Square Cleveland, OH 44114	(800)321-8642	JN-3 EOC Flam Storage Cabinet	1 (5 gal) 5 (1 gal)
Gleme Glass Cleaner	Claire Mfg. Co. Addison, IL 60101	(312)543-7600	JN-1 Rm 1105B	
Liquid Propane	Eberline Inst. Corp. Santa Fe, NM 81501	(505)471-3232	• JN-3 Rm 3222 • JN-3 EOC Flam Storage Cabinet	36 (6 oz) cylinders 12 (6 oz) cylinders
Mobil Havy Duty Oil SAE-30	Mobil Oil Corp New York, NY 10017	(800)662-4525	JN-3 EOC Flam Storage Cabinet	12 (1 qt)
North Respirator Refresher Wipe Pad	North Safety Equip. 2000 Plainfield Pike Cranston, RI 02921	(401)943-4400	JN-2 Respirator Room	
Potassium Permanganate	JT Baker Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	
Propane (LPG)	Commonwealth Petroleum Co. 5400 Dupont Circle Milford, OH 45150	(800)878-4427	JN-3 EOC Flam Storage Cabinet	2 (25 lb) cylinders
Radiacwash #005-100	Atomic Products Corp. Shirley, NY 11967		JN-3	1

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE F: HEALTH PHYSICS SUPPLIES INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Snoop Liquid Leak Detector	Nupro Co. 4800 E. 345th St. Willoughby, OH 44094	(216)951-7100	JN-1 Rm. 1105B	1
Sodium Bisulfite	JT Baker Phillipsburg, NJ 08865	(908)859-2151	JN-2 Rad Lab	
Spray Nine	Knight Oil Corp. 251 N. Comrie Ave. Johnstown, NY 12095	(518)762-4591	JN-1,JN-2,JN-3	24 (1pt)
Static Guard XS-3 & XS-6	Alberto Culver Co. 2525 Armitage Ave. Melrose Park, IL 60160	(708)450-3175	JN-1 JN-2 JN-3	24 (5.5 oz aerosol cans)
Wipe Out Disinfectant Towelett (L42-IT5)	Health Care Products, Inc. Sherman Oaks, CA 91403	(416)567-1499 (905)890-7100	JN-2 Respirator Room	
Zep Old Smoky #0071	ZEP Mfg. Co. P.O. Box 2015 Atlanta, GA 30301	(404)352-1880	JN-1,JN-2,JN-3	24 (22.5 oz aerosol cans)

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE G: BUILDING JN-1 STOREROOM INVENTORY

Chemical Name & Product Number	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Duo Seal Pump Oil 54996-230	Sergent-Welch Scientific Co. 7300 N. Linder Ave. Spokie, IL	(708)459-6625 (800)932-5000	JN-1	2 (1 gal)
Radiac Wash 120763	Atomic Prod. Corp. P.O. Box 702 Shirley, NY 11967-0917		JN-1	25 (1 gal)
Snoop Liquid Leak Detector	Nupro Co. 4800 E. 3457th St. Willoughby, OH 44094	(216)951-7100	JN-1 Storeroom	2 gal
SOS Scrub Pads *	Consumer Household Prod. Chicago, IL 60638		Storeroom	
Spray Nine #26824	Knight Marketing Corp. Johnstown, NY 12095	(518)762-4591	JN-1 Storeroom	
Weatherstrip & Caulking Cord *	Mortite Kankakee, IL 60901		JN-1 Storeroom	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE H: MECHANICAL & MAINTENANCE SUPPLIES INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Acrylic Latex Caulk plus Silicone 62772 *	DAP Inc. Dayton, OH 45401		JN-2 Boiler Rm	
Antifreeze/Coolant Ethylene Glycol	Old World Automotive Products 4065 Commercial AVe. Northbrook, IL	(708)559-2000	JN-1 Boiler Rm	1 (1 gal)
CFP 399 Scalant	Elco Industries, Inc. Rockford, IL 61125	(800)435-7213	JN-1 Boiler Rm	
Clear Finish Satin H17	Pratt & Lambert Inc Buffalo, NY 14240	(716)377-6555	JN-2 Boiler Rm	
Energrease LC-EP2	BP Oil Co. Cleveland, OH 44114	(216)441-8124	JN-1 Boiler Rm	
Form-a-Gasket No. 2	Permatex Co. Inc. Kansas City, KS 66115	(216)663-3011	JN-1 Boiler Rm	
Gold End Paste-900 00909	A.W. Chesterton Co. Stoneham, MA 02180	(617)438-7000	JN-2 Boiler Rm	
Grefpatch 57 2B510L1	General Refractories Co. U.S. Refractories Div. 600 Grant St. Rm 3000 Pittsburgh, PA 15219	(412)442-5000	JN-1 Boiler Rm	1 (5 qt) bucket
Hardness Reagent 3	Hach Co P O Box 907 Ames, IA 50010	(303)623-5716	JM-Wellhouse	
Kendall Motor Oil-All Grades (non detergent)	Kendall Refining Co. Division of Witco Chemical Ashland, KY 41114	(814)368-6111	JN-1 Boiler Rm JN-2 Boiler Rm JN-3 Boiler Rm	3 qt 6 qt
Krylon Spray Paint Baby Blue 1902	Borden, Inc. Dept HPPG-Krylon Columbus, OH 43215	(216)292-7400 (800)247-3266	JN-2 Boiler Rm Flam. Stor Cab	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE H: MECHANICAL & MAINTENANCE SUPPLIES INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Krylon Spray Paint Glossy Black 1601	Borden, Inc. Dept HPPG-Krylon Columbus, OH 43215	(216)292-7400 (800)247-3266	JN-2 Boiler Rm Flam. Stor Cab	
Krylon Spray Paint Glossy White 1501	Borden, Inc. Dept HPPG-Krylon Columbus, OH 43215	(216)292-7400 (800)247-3266	JN-2 Boiler Rm Flam. Stor Cab	
Krylon Spray Paint Glowing Red Orange 3101	Borden, Inc. Dept. HPPG-Krylon Columbus, OH 43215	(216)292-7400 (800)247-3266	JN-1 Boiler Rm JN-2 Boiler Rm Flam Stor Cab	7 (11 oz) cans
Krylon Spray Paint Regal Blue 1901	Borden, Inc. Dept HPPG-Krylon Columbus, OH 43215	(216)292-7400 (800)247-3266	JN-2 Boiler Rm Flam. Stor Cab	
Layn Grease *	Layne & Bowles, Inc. Memphis, TN		JN-1 Boiler Rm	
Majic Quick Dry Paint Everwhite *	Yenkin Majestic Paint Co Columbus, OH 43219		JN-2 Boiler Rm	6 (1 gal)
Metro Cleaner	Metropolitan Refining Co. 50-23 23rd St. Long Island City, NY 11101	(718)729-7200	JN-Wellhouse	1 (5 gal)
Metrosperse 269	Metropolitan Refinery 50-23 Twenty Third St. Long Island City, NY 11101	(718)729-7200	JN-2 Boiler Rm	2 (5 gal)
Never-Seez NSA-16	Emhart Bostik Bostik Division Boston Street Middleton, MA 01949	(508)777-0100	JN-1 Boiler Rm JN-2 Boiler Rm	
Nissen Metal Marker	John P. Nissen Co. Glenside, PA	(215)886-2025	JN-1 Boiler Rm	
Nitrite Reagent #1 7102-G	Lamotte Chestertown, MD 21620	(718)729-7200	JN-1 Boiler Rm JN-2 Boiler Rm JN-3 Boiler Rm	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE H: MECHANICAL & MAINTENANCE SUPPLIES INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Nitrite Reagent #2 7103 P-SH	Lamotte Chestertown, MD 21620	(718)729-7200	JN-1 Boiler Rm JN-2 Boiler Rm JN-3 Boiler Rm	
Oatey #5 Soldering Paste *	Oatey Cleveland, OH 44135		JN-1 Boiler Rm	
Osage Super 30 Oil	Arco Lubricants Lyondell Petrochemical Co. Houston, TX 77017	(800)525-4692	JN-1 Boiler Rm	1 (5 gal)
Oster Dark Bestoil	Teledyne Landis/Oster Waynesboro, PA 17269	(717)762-3151	JN-1 Boiler Rm	
Pipe Scalant w/Teflon 59231	Loctite Corp. Newington, CT 06111	(216)663-3011	JN-1 Boiler Rm	
Platinum Sherman Williams Semi-Gloss Paints *	Sherman Williams Co. Cleveland, OH 44101		JN-2 Boiler Rm	2 (1 gal)
Pro-tek Protection Cream (Invisible Glove)	Krylon Industrial 6830 Cochran Rd. Solon, OH 44139	(800)247-3268	JN-1 Boiler Rm JN-2 Boiler Rm	
Propane Fuel Cylinder	Benzomatic Corp. Medina, NY 14103	(716)798-4949	JN-1 Boiler Rm	
Rope & Tape Boiler Gaskets	Owens-Corning Fiberglass Corp. Fiberglass Tower Toledo, OH 43659	(419)248-8234	JN-1 Boiler Rm	
Rust-Oleum Spray Paint * Dark Blue	Rust-Oleum Corp. 11 Hanthorn Parkway Vernon Hills, IL 60061		JN-1 Boiler Rm	
Shellac	Parks Corp. Somerset, MA 02726	(508)679-5938	JN-2 Boiler Rm	
Snoop Leak Detector	Nupro Co. 4800 E 345th St. Willoughby, OH 44094	(216)951-7100	JN-1 Boiler Rm	
SpraSolvo 723	A.W. Chesterton Co. Stoneham, MA 02180	(617)438-7000	JN-1 Boiler Rm	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

TABLE H: MECHANICAL & MAINTENANCE SUPPLIES INVENTORY

Chemical Name	Manufacturer's Name & Address	Manufacturer's Phone No.	Location	Volume (if > 1 gal)
Valvoline 40W non-detergent *	Valvoline Oil Co. Division of Ashland Oil Ashland, KY 41114		JN-1 Boiler Rm	
Vaporene N-90	Metropolitan Refining Co. 5023 23rd Street Long Island, NY 11101	(718)729-7800	JN-1 Boiler Rm JN-2 Boiler Rm JN-3 Boiler Rm	1 (5 lb) 1 (5 lb) 1 (5 lb)
Water Softner Salt Dura Cube	Akzo Salt, Inc. Clarks Summit, PA 18411	(717)587-5131	JN-Wellhouse	75 (50 lb)
ZEP Old Smoky	ZEP Manufacturing Co. Executive Offices Atlanta, GA 30318	(404)352-1680	JN-1 Boiler Rm	

*These products do not have and are not required to have Material Safety Data Sheets (MSDSs). See 29CFR 1910.1200(b)(6)(vii)

Radioanalytical Laboratory (RAL) Wastewater

The following table is the summary of wastewater transferred from the JN-2 RAL to the JN-1 evaporator holding tank for calendar years 1994 and 1995. The RAL presently processes BCLDP environmental and BCLDP King Avenue D&D samples. While historical in nature, this data should be representitive of future volumes transferred. This is due to the fact that the RAL will be responsible for processing West Jefferson samples when work at King Avenue is finished.

Date Transferred	Volume Transferred (gallons)	Verification Initials
2/1/94	350	MB
6/24/94	350	MB
10/26/94	400	MB
3/9/95	400	MB
6/27/95	500	MB
10/25/95	550	MB

Source: JN-1 evaporator log book

Emissions Data

- Basis for Particulate Emissions Estimate
- Air Quality Comparison
- West Jefferson North Site Stack Emissions CY1994
- BCLDP Dose Comparison (based on COMPLY)
- COMPLY Computer Run for BCLDP Operations at the West Jefferson North Site for CY94

Basis for Particulate Emissions Estimate

Assumptions

- 250,000 ft^2 of surface area to be grit blasted
  (this is a conservative estimate based on the 48,000 ft^2 currently posted by the BCLDP as "Fixed Surface Contamination Area")
- Average blasting speed of 50-60 ft^2 per hour achieved
  (based on data compiled by the BCLDP, gathered during blasting at the King Avenue campus)
- 40 hours of blasting to an average depth of 30 mil will yield approximately 300 pounds of particulate matter (PM); paint and concrete chips
  (based on data compiled by the BCLDP, gathered during blasting at the King Avenue campus)
- The LTC Americas model 1060 with HEPA kit installed will maintain a containment of 99.95% In the calculation below, credit is taken for the HEPA kit.
  (North Carolina State University independent test data provided to the BCLDP by LTC Americas)
- HEPA filters are tested to an efficiency of 99.95% in accordance with BCLDP Health Physics Operating Procedures, used to maintain negative pressure in the work area enclosure. While dual HEPA filters are typically used, credit is only taken for one.

Therefore:

- 1 hour of blasting , approximately 50 ft^2 yields 7.5 lbs. of PM
- 1 ft^2 = 0.15 lbs. PM
- 250,000 ft^2 surface area

(0.15) (250,000) (0.0005) (0.0005) = 0.009 lbs. of PM

Air Quality Comparison

The following table compares the air quality prior to and during vacuum abrasive blasting at the Battelle King Avenue campus. The data was collected from the environmental air sampling station located at the east boundry of Battelle property (EA-15). This data is presented to illustrate that there was no significant deterioration to air quality in terms of radionuclides emitted due to decontamination and decommissioning at the Battelle King Avenue campus. The average annual sample volume was 3.70×10^{10} ft^3.

Year	Gross Alpha (μCi/mL)	Gross Beta (μCi/mL)	Level of Activity
1990	$1.51 \pm 0.59 \times 10^{-15}$	$1.62 \pm 0.13 \times 10^{-14}$	Prior to Abrasive Blasting at King Avenue campus
1991	$1.43 \pm 0.58 \times 10^{-15}$	$1.43 \pm 0.12 \times 10^{-14}$	
1992	$1.48 \pm 0.28 \times 10^{-15}$	$1.30 \pm 0.58 \times 10^{-14}$	
1993	$1.19 \pm 0.24 \times 10^{-15}$	$1.27 \pm 0.055 \times 10^{-14}$	Abrasive Blasting performed in building KA-3 (completed late 1994)
1994	$1.67 \pm 0.37 \times 10^{-15}$	$1.47 \pm 0.085 \times 10^{-14}$	

Source: Site Environmental Reports 1990-1994

Based on Table 3. Annual Radionuclide Release Inventory - West Jefferson Site -- 1994, BCLDP Site Environmental Report for Calendar Year 1994

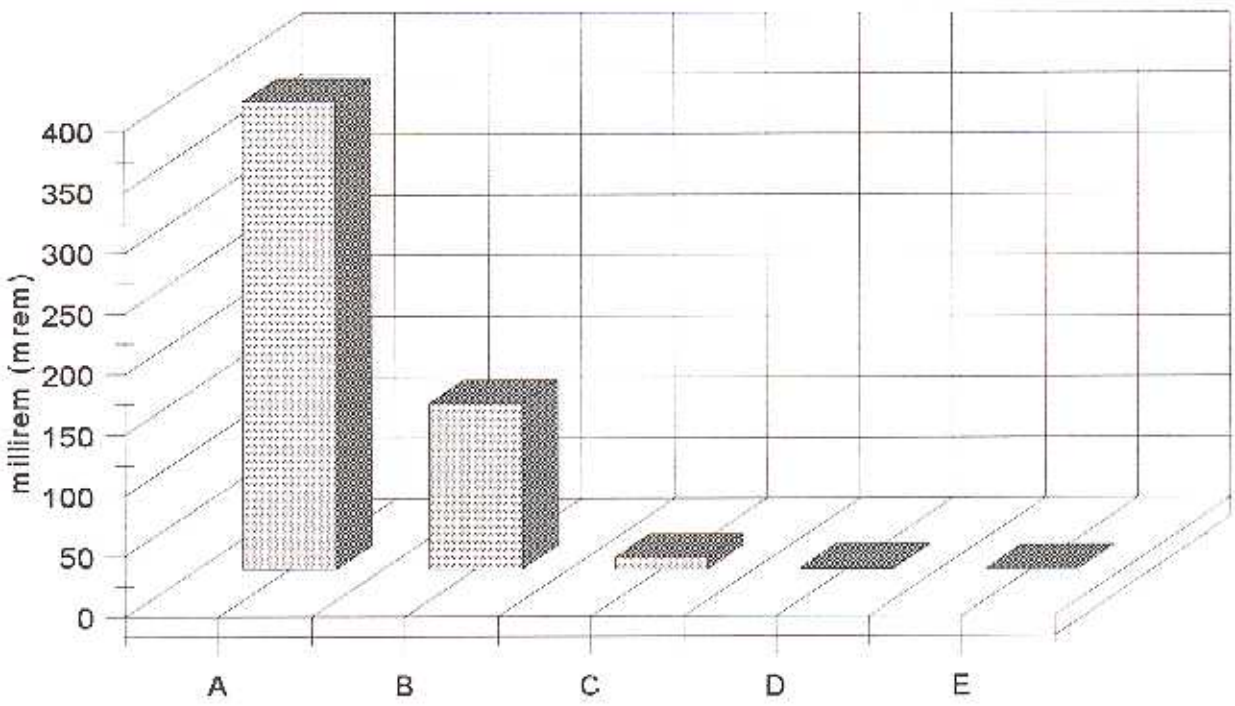
Nuclide	EIS #001	EIS #002	EIS #003	EIS #004	EIS #012	EIS #013	EIS #014	Total Activity (Ci/yr)
Co-57	1.52E-07	2.41E-07	1.14E-07	5.13E-08	6.22E-09	3.83E-08	4.69E-08	6.49E-07
Co-60	3.02E-07	5.00E-07	2.28E-07	1.03E-07	9.13E-09	8.29E-08	1.02E-07	1.33E-06
Sr-90	6.89E-08	1.42E-07	3.46E-07	2.54E-08	5.07E-09	1.89E-08	2.99E-08	6.36E-07
Sb-125	7.05E-07	1.63E-06	5.45E-07	2.40E-07	2.21E-08	1.93E-07	2.32E-07	3.57E-06
Cs-134	2.65E-07	4.29E-07	2.05E-07	9.88E-08	9.11E-09	8.82E-08	8.98E-08	1.17E-06
Cs-137	2.85E-07	4.76E-07	2.19E-07	1.07E-07	8.62E-09	7.44E-08	9.52E-08	1.26E-06
Eu-152	4.24E-07	6.74E-07	3.17E-07	1.42E-07	1.39E-08	1.07E-07	1.31E-07	1.81E-06
Eu-154	3.00E-07	4.68E-07	2.24E-07	1.03E-07	9.66E-09	7.63E-08	9.21E-08	1.27E-06
U-235	1.15E-06	1.93E-06	8.70E-07	4.00E-07	4.17E-08	2.80E-07	3.41E-07	5.02E-06
U-238	2.59E-06	3.83E-06	1.66E-06	8.70E-07	8.17E-08	6.47E-07	8.97E-07	1.09E-05
Pu-238	3.47E-09	3.52E-09	1.46E-09	7.83E-10	1.95E-10	7.00E-10	7.99E-10	1.09E-05
Pu-239	8.46E-10	1.80E-09	6.73E-10	6.98E-10	6.40E-11	3.92E-10	4.03E-10	4.88E-09
Am-241	2.57E-07	3.77E-07	2.66E-07	8.57E-08	6.95E-09	1.05E-07	1.02E-07	1.22E-06

Nuclide	Specific Activity (Ci/gm)	Ci/lb	lb/yr	lb/day	lb/hr	Ci/day	Ci/hr
Co-57	6.48E+03	3.85E+06	1.69E-13	4.62E-16	1.93E-17	1.78E-09	7.41E-11
Co-60	1.13E+03	5.13E+05	2.59E-12	7.09E-15	2.95E-16	3.63E-09	1.51E-10
Sr-90	1.41E+02	6.40E+04	9.94E-12	2.72E-14	1.13E-15	1.74E-09	7.26E-11
Sb-125	1.06E+03	4.81E+05	7.43E-12	2.04E-14	8.48E-16	9.78E-09	4.08E-10
Cs-134	1.30E+03	5.90E+05	1.98E-12	5.41E-15	2.26E-16	3.19E-09	1.33E-10
Cs-137	8.70E+01	3.95E+04	3.20E-11	8.78E-14	3.66E-15	3.46E-09	1.44E-10
Eu-152	1.72E+02	7.80E+04	2.32E-11	6.35E-14	2.65E-15	4.95E-09	2.06E-10
Eu-154	2.66E+02	1.21E+05	1.05E-11	2.89E-14	1.20E-15	3.49E-09	1.45E-10
U-235	2.14E-06	9.71E-04	5.17E-03	1.42E-05	5.90E-07	1.37E-08	5.73E-10
U-238	3.33E-07	1.51E-04	7.20E-02	1.97E-04	8.22E-06	2.96E-08	1.24E-09
Pu-238	1.68E+01	7.62E+03	1.43E-12	3.93E-15	1.64E-16	2.99E-11	1.25E-12
Pu-239	6.10E-02	2.77E+01	1.76E-10	4.83E-13	2.01E-14	1.34E-11	5.57E-13
Am-241	3.39E+00	1.54E+03	7.93E-10	2.17E-12	9.05E-14	3.34E-09	1.39E-10

Total Activity (Ci/yr)	2.88E-05
Total Activity (uCi/yr)	2.88E+01
Emission Rate (Ci/day)	7.90E-05
Emission Rate (uCi/day)	7.90E-02
Emission Rate (lb/day)	2.11E-04

1 lb = 453.59 gm

BCLDP Dose Comparison



A **360 mrem;** Annual average exposure to individuals due to backgound radiation, NCRP 93, 1987

B **100 mrem;** Annual total effective dose equivalent limit for individual members of the public; 10 CFR 20, Section 20.1301(a)(1)

C **10 mrem;** NESHAP Annual Standard (compliance limit); 40 CFR 61, Subpart I, Section 61.102(a)

D **1 mrem;** NESHAP reporting requirement limit (10% of annual standard); 40 CFR 61, Subpart I, Section 61.104(b)

E **.00014 mrem;** In the unlikely event of an air release and presuming that all unsealed radioactive sources were available for release, this value represents the West Jefferson North site contribution to the annual maximum individual dose to the public as assessed by the EPA computer code COMPLY. 40 CFR 61, Subpart I, Section 61.103(a)

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Project Number _____

Internal Distribution

S. Layendecker
E. Swindall
D. Clum
BMI ES&H Files
Project Records (2)

Date April 11, 1995

To C. Jensen

From Larry R. Sanders (ARC) LRS

Subject Report Information and Data for COMPLY Computer Run for BCLDP Operations at the West Jefferson North Site for CY94 Using Building JN-1B as the Release Point

I. Problem Statement

An assessment by use of the COMPLY computer code was used to determine if all unsealed radioactive materials associated with BCLDP operations for the West Jefferson North Site for CY94 meet 40 CFR 61, EPA, reporting requirements. The requirements state that annual maximum individual dose to the public less than 1 mrem/yr does not require reporting and is in compliance.

II. Assumptions and Rationale

The COMPLY computer model was used since it is the model referenced in 40 CFR 61 to show compliance with the requirements. Source term radionuclides are considered available for release as unsealed particulate material from the JN-1 Hot Cell Laboratory as primarily internal contamination inside the hot cells. Source term radionuclides from the JN-1 spent fuel pool and the radionuclide inventory of the Radioanalytical Laboratory (RAL) are also assumed available for release as unsealed particulate material. Any H-3 released would originate from the JN-1B pool. Accordingly, a factor of 1E-3 was used for particulates from all sources calculated into the source term. A factor of 1E-2 was used for HEPA filtration to retain the particulates within the hot cells and the JN-1 building for the source term associated with the hot cells and the JN-1 spent fuel pool. Both factors are cited in 40 CFR 61 as permissible for use. Additionally, all of the 3 Kg of irradiated fuel, the available inventory in the spent fuel pool and the inventory associated with the RAL used as the basis for the total available inventory was assumed to be available for release when in actuality, less than this amount is available. Furthermore it is assumed that the receptor vegetable, milk, and meat farms are located in the predominate wind direction, and that animals were fed plants grown in the immediate area. The assessment was considered to have been performed on a conservative basis.

Distances to area residences were taken from topographical maps obtained from the U.S. Geological Survey and hand-extrapolated to a map illustrating the 16 compass points associated with the directions of the sections of a wind rose.

Additionally, distances to three farm sites — vegetables, milk, and meat — were as follows. Vegetable farming was calculated at a distance of 150 meters. At this distance corn is grown on Battelle-owned adjoining property located to the north of JN-1 at the site-property line where soybeans and corn are grown by area farmers. It is assumed that all vegetables produced by area farmers just outside the property

line are consumed by area residents. Also, the milk produced at a distance of 4828 meters (approximately 3 miles) in the NE sector is assumed to be consumed by area residents. The location of the dairy farm has been documented in correspondence to Craig Jensen from John Tholen, dated January 28, 1994. A further assumption is that animals raised 12,875 meters (approximately 8 miles) west of the site at Summerford, Ohio, are fed grains grown adjacent to the site as mentioned above. It is also assumed that the meat is consumed by area residents located within the 16 sectors associated with the COMPLY computer run. The location of the meat producer in Summerford, Oh was provided by Larry Stickel, a West Jefferson Site staff member and area resident and farmer.

III. Calculations

Input Data: Refer to Attachments A, B, C, D, E, F, G, H, I, and J

Computer Model: COMPLY CODE was used for dose assessment calculations.

Input Data Elaboration: **Attachment A** is taken from the COMPLY User's Manual with additional information showing the other attachments that contain required input data to run the COMPLY code.

Attachment B is a copy of a list of nuclides provided by Rajiv Kohli from an ORIGEN computer run of irradiated fuel contamination inside the hot cells available for release as particulates. The weight of 1.816 Kg of irradiated fuel was corrected to 3 Kg fuel available for release. The correction factor was provided by Rajiv Kohli.

The activities for U-234, U-235, and U-238 are calculated as follows. The mass of each isotope is calculated from its given specific activity. Each isotope mass is summed to a total mass. This isotope total mass is subtracted from 1.816 Kg of given fuel. The remaining mass is U-235, U-235, and U-238. It is assumed, of the remaining mass that 0.03 percent is U-234, 0.3 percent is U-235, and 99.67 percent is U-238. The masses of U-234, U-235, and U-238 are then converted to specific activity.

Ba-137m and Rh-106 are included in the fuel isotopic breakdown provided by Rajiv Kohli. The two isotopes are not included in the COMPLY program library.

These isotopes are used to calculate the activity of U-234, U-235, and U-238, but are not entered into the COMPLY program. The parents of these nuclides are Cs-137 and Ru-106 and are in the COMPLY program.

Attachment C is a table listing the nuclides from Attachment B, incorporating suspension factors, HEPA filtration factors, and adjusted curies of material based on the 3 Kg of irradiated fuel.

Attachment D is a memo from J. Sarge to S. Layendecker containing the isotopic inventory of the JN-1 spent fuel pool with activity concentrations utilized in the source term calculations.

Attachment E is the spreadsheet utilized to calculate the source term for JN-1. The source term contained isotopes from 3 sources. The unsealed isotopes contained in the Radioanalytical Laboratory (RAL), the JN-1 spent fuel pool and the JN-1 hot cells are utilized as the isotope inventory in the attached calculations. Resuspension and adjustment factors are utilized when permissable by 40CFR61 Appendix D. The RAL inventory is derived from the active and inactive Radioactive Material Applications which are maintained by the BCO Radiation Safety Services (RSS). The JN-1 Pool inventory is obtained from Attachment D. The JN-1 hot cell inventory is obtained from Attachment B and C.

Attachment F is a table obtained from Battelle Facilities Engineering staff showing the height of JN-1B as 62 feet (19 meters) used for the calculations.

Attachment G is an illustration of the 16 sectors of the wind rose used for site calculations, with respective locations of nearest residences.

Attachment H is a Battelle Facilities Engineering drawing illustrating the dimensions of Building JN-1B used for the calculations.

Attachment I is the wind rose data used for the calculations. Distances to the nearest vegetable, milk, and dairy farms is also included.

Attachment J contains a copy of the COMPLY computer run for the assessment for JN-1.

IV. References

1. U.S. Environmental Protection Agency (EPA) National Emission Standards for Hazardous Air Pollutants; 40 CFR Part 61, Subpart I, National Emission Standards for Radionuclide emissions From Facilities Licensed by the Nuclear Regulatory Commission and Federal Facilities Not Covered by subpart H (National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities, 61.101, July 1, 1991.

2. U.S. Environmental Protection Agency, Office of Radiation and Indoor Air, COMPLY Code, October 1989.

3. U.S. Environmental Protection Agency, Office of Radiation and Indoor Air, User's Guide for the COMPLY Code (Rev. 2), EPA-520/1-89-003, October 1989.

4. National Climatic Data Center, Ashville, NC, Wind Rose for Columbus, Ohio 1965-1974.

5. Franklin County Engineer's Office, Franklin County Map, 1993.

6. U.S. Geological Survey. Madison and Franklin County Topographical Maps,

7. Tholen, J., BCO Environmental Radiological Monitoring Bridging Document to C. Jensen regarding dairy farm locations, January 28, 1994.

IV. Conclusions

The computer run was performed to address the requirement of 40 CFR 61 to determine the annual dose for CY 94 for operations associated at the West Jefferson North Site, specifically from Building JN-1. The calculated dose is 1.4 E-4 mrem/yr and 7.4 E-6 mrem/yr due to Iodine. This is significantly less than the criterion of 1 mrem/yr that requires reporting. Doses greater than 1 and less than or equal to 10 mrem/yr are in compliance and require reporting. Doses greater than 10 mrem/yr are not in compliance and require reporting.

C:\wp51\files\comply.jnl

For Review and Approval

	Name	Initials	Date
Originator	L. R. Sanders (ARC)	[illegible]	4/11/95
Concurrence	Rajiv Kohli, Technical Support Manager	[illegible]	4/16/95
Approved	Craig Jensen, Rad Technical Support Manager	[illegible]	12/13/95

ATTACHMENT A

ATTACHMENT A

Input Parameters Required for Various Methods
(West Jefferson North Site, JN-1 BCLDP Activity CY 1994)

Parameter	Needed at Levels	Default Value	Comment
Nuclide names	1-4	None	See Attachment E
Concentrations (Ci/yr)	1	None	See Attachment E
Annual possession amounts	1	None	See Attachment E
Release rates	1-4	None	See Attachment E
Release height (19 M)	2-4	None	See Attachment H
Building height (19 M)	2-4	None	See Attachment H
Stack or vent diameter[a]	2-4	None	No Input Required by User
Volumetric flow rate (m^3/s)[a]	2-4	0.3	Default Values Used
Distance from source to receptor	2-4	None	See Attachment G
Building width[b] (23 M)	2-4	None	See Attachment H
Wind speed[c]	2-4	2	See Attachment I
Distances to sources of food production (farms)[d]	3-4	None	See Attachment I
Stack temperature, F[e]	4	55	Default Values Used
Ambient air temperature, F[e]	4	55	Default Values Used
Wind rose[f]	4	None	See Attachment I
Building length[g] (26 M)	4	None	See Attachment H

Notes:

(a) Needed at levels 2 and 3 only if source and receptor are on the same building. Needed at level 4 if source and receptor are on the same building or if stack height is more than 2.5 times the building height.

(b) Needed only if stack height is less than or equal to 2.5 times the building height.

(c) At level 4, needed if user has not specified a wind rose.

(d) At level 3, there are two farms — one for vegetables and one for milk and meat. At level 4, there are three farms — one each for vegetables, milk, and meat.

(e) Needed only if stack height is greater than 2.5 times the building height.

(f) Needed only if user has specified he wants it.

(g) Needed only if stack height is less than or equal to 2.5 times the building height and the user has specified a wind rose.

ATTACHMENT B

ATTACHMENT B

Measured and Calculated Radioisotope Activities for Waste Package S-1

TRU CHARACTERIZATION DATA - LOW LEVEL CELL CANS
CALCULATION OF GAMMA, FISSION AND ALPHA EMITTING ACTIVITIES

CANISTER # S-1 WEIGHT: 1.316E+03 Grams
BURNUP: 33,000 MWD/mtu
ENRICHMENT: 3.0 % U-235
DECAY: 10 Years
Eu-154 Act.: 3.110E+00 mCi * (* = Value from GAMMA SPECTROSCOPY)

NUCLIDE	Activity (mCi)	% of Matrix	NUCLIDE	Activity (mCi)	% of Matrix
Sr-90	3.619E+01	10.04	Pu-244	1.315E-10	9.195E-11
Y-90	3.620E+01	10.04	Am-241	1.137E+00	0.32
Tc-99	8.412E-03	2.333E-03	Am-242m	4.539E-03	1.259E-03
Cd-113m	2.368E-02	6.567E-03	Am-243	1.253E-02	3.477E-03
Sb-125	7.791E-01	0.22	Cm-242	3.743E-03	1.038E-03
Te-125m	1.396E-01	0.05	Cm-243	1.199E-02	3.326E-03
I-129	2.068E-05	5.736E-06	Cm-244	1.019E+00	0.28
Cs-134 *	5.930E+00	1.64	Cm-245	1.162E-04	3.224E-05
Cs-137 *	1.090E+02	30.23	Cm-246	2.608E-05	7.233E-06
Ba-137m *	1.031E+02	28.60	Cm-247	7.351E-11	2.039E-11
Pr-144	9.706E-02	0.03	Cm-248	1.726E-10	4.787E-11
Pm-147	6.024E+00	1.67	Cm-250	1.951E-17	5.411E-18
Sm-151	1.940E-01	0.05	Cf-249	1.731E-09	4.801E-10
Eu-154 *	3.110E+00	0.86	Cf-250	5.364E-09	1.488E-09
Eu-155	1.068E+00	0.30	Cf-251	5.054E-11	1.402E-11
U-233	1.785E-08	4.950E-09	H-3	3.044E-01	0.08
Np-237	2.029E-04	5.627E-05	C-14	4.042E-04	1.121E-04
Np-238	2.269E-05	6.294E-06	Mn-54	3.283E-07	9.107E-08
Np-239	1.253E-02	1.477E-03	Fe-55	4.879E-04	1.353E-04
Pu-236	1.658E-05	1.015E-05	Ni-59	8.619E-06	2.391E-06
Pu-238	1.565E+00	0.43	Ni-63	1.097E-03	3.044E-04
Pu-239	2.034E-01	0.06	Co-60 *	6.110E-01	1.695E-01
Pu-240	1.484E-01	0.10	Rh-106	1.780E-01	0.10
Pu-241	5.217E+01	14.47	Ru-106	1.780E-01	0.10
Pu-242	1.217E-03	1.376E-04	Ce-144	9.706E-02	0.03
			Sb-125 *	1.500E-01	0.10
		TOTAL ACTIVITY (mCi) =		1.605E+02	
		TRU CONTENT (nCi/g) = (Not including Pu-241)		1.309E+03	
		Pu-241 (nCi/g) =		1.373E+04	

ATTACHMENT C

ATTACHMENT C

Curie content scaled up to 3 Kg fuel by the following equation:

$$\frac{mCi\ isotope}{1.816\ E\ 3\ grams} / \frac{1000\ grams}{Kg} /3\ Kg = mCi\ @\ 3\ Kg$$

Nuclide	mCi	Ci	Incorporating Resuspension Factor of	Also Incorporating HEPA Filtration Factor	Curies (Ci) Final Activity Incorporating Columns 5 and 6 Combined Factor 1E-5
Sr-90	5.979E+1	5.979E-2	1E-3	1E-2	5.979E-7
Y-90	5.980E+1	5.980E-2	1E-3	1E-2	5.980E-7
TC-99	1.390E-2	1.390E-5	1E-3	1E-2	1.390E-10
Cd-113M	3.912E-2	3.912E-5	1E-3	1E-2	3.912E-10
Sb-125	1.287+00	1.287E-3	1E-3	1E-2	1.287E-8
Te-125M	3.132E-1	3.132E-4	1E-3	1E-2	3.132E-9
I-129	3.41E-5	3.41E-8	-0-	1E-2	3.416E-10
Cs-134	9.796+00	9.796E-3	1E-3	1E-2	9.796E-8
Cs-137	1.801E+2	1.801E-1	1E-3	1E-2	1.801E-6
Pr-144	1.603E-1	1.603E-4	1E-3	1E-2	1.603E-9
Pm-147	9.952+00	9.952E-3	1E-3	1E-2	9.952E-8
SM-151	3.205E-1	3.205E-4	1E-3	1E-2	3.205E-9
Eu-154	5.138E+00	5.138E-3	1E-3	1E-2	5.138E-8
Eu-155	1.764E+00	1.764E-3	1E-3	1E-2	1.764E-8
U-233	2.949E-8	2.949E-11	1E-3	1E-2	2.949E-16
NP-237	3.352E-4	3.352E-7	1E-3	1E-2	3.352E-12
NP-238	3.748E-5	3.748E-8	1E-3	1E-2	3.748E-13
NP-239	2.070E-2	2.070E-5	1E-3	1E-2	2.070E-10
Pu-236	6.043E-5	6.043E-8	1E-3	1E-2	6.043E-13
Pu-238	2.585E+00	2.585E-3	1E-3	1E-2	2.585E-8
Pu-239	3.360E-1	3.360E-4	1E-3	1E-2	3.360E-9
Pu-240	5.756E-1	5.756E-4	1E-3	1E-2	5.756E-9
Pu-241	8.618E+1	8.618E-2	1E-3	1E-2	8.618E-7
Pu-242	2.010E-3	2.010E-6	1E-3	1E-2	2.010E-11
Pu-244	5.476E-10	5.476E-13	1E-3	1E-2	5.476E-18

Nuclide	mCi	Ci	Incorporating Resuspension Factor of	Also Incorporating HEPA Filtration Factor	Curies (Ci) Final Activity Incorporating Columns 5 and 6 Combined Factor 1E-5
Am-241	1.878E+00	1.878E-3	1E-3	1E-2	1.878E-8
Am-242m	7.498E-3	7.498E-6	1E-3	1E-2	7.498E-11
Am-243	2.070E-2	2.070E-5	1E-3	1E-2	2.070E-10
Ba-137m	1.703E+2	1.703E-1	1E-3	1E-2	1.703E-6
Cm-242	6.183E-3	6.183E-6	1E-3	1E-2	6.183E-11
Cm-243	1.981E-2	1.981E-5	1E-3	1E-2	1.981E-10
Cm-244	1.683+00	1.683E-3	1E-3	1E-2	1.683E-8
Cm-245	1.920E-4	1.920E-7	1E-3	1E-2	1.920E-12
Cm-246	4.308E-5	4.308E-8	1E-3	1E-2	4.308E-13
Cm-247	1.214E-10	1.214E-13	1E-3	1E-2	1.214E-18
Cm-248	2.851E-10	2.851E-13	1E-3	1E-2	2.851E-18
Cm-250	3.223E-17	3.223E-20	1E-3	1E-2	3.223E-25
Cf-249	2.860E-9	2.860E-12	1E-3	1E-2	2.860E-17
Cf-250	8.861E-9	8.861E-12	1E-3	1E-2	8.861E-17
Cf-251	8.349E-11	8.349E-14	1E-3	1E-2	8.349E-19
H-3 (In Pool H_2O)	5.029E-1	5.029E-4	1E-3	1E-2	5.029E-9
C-14	6.677E-4	6.677E-7	1E-3	1E-2	6.677E-12
Mn-54	5.423E-7	5.423E-10	1E-3	1E-2	5.423E-15
Fe-55	8.060E-4	8.060E-7	1E-3	1E-2	8.060E-12
Ni-59	1.424E-5	1.424E-8	1E-3	1E-2	1.424E-13
Co-60	1.009E+00	1.009E-3	1E-3	1E-2	1.009E-8
Ru-106	6.244E-1	6.244E-4	1E-3	1E-2	6.244E-9
Ce-144	1.603E-1	1.603E-4	1E-3	1E-2	1.603E-9
Sb-125	5.782E-1	5.782E-4	1E-3	1E-2	5.782E-9
Ni-63	1.812E-3	1.812E-6	1E-3	1E-2	1.812E-11
U-234	5.625E+00	5.625E-3	1E-3	1E-2	5.625E-8
U-235	1.946E-1	1.946E-4	1E-3	1E-2	1.946E-9
U-238	8.607E-1	8.607E-4	1E-3	1E-2	8.607E-9
Rh-106	6.244E-1	6.244E-4	1E-3	1E-2	6.244E-9

ATTACHMENT D

ATTACHMENT D

Project Number _____

Battelle
. . . Putting Technology To Work

Internal Distribution

C. Jensen
G. Kirsch
T. Walker
D. Clum
M. Failey
E. Swindall
J. Tholen
J. Jacobsen
E. Carl (ARC)
BMI ES&H Files
Project Records

Date October 19, 1994

To Steve Layendecker

From Jim Sarge (ARC) and Scott Griffin (ARC)

Subject JN-1 Pool Water Clean-up For Release.

I. Problem Statement

The purpose of this study is to develop an acceptable methodology whereby JN-1 pool water may be processed and released. The study will address regulatory compliance relative to liquid effluent release to the Big Darby Creek.

II. Assumptions and Rationale

- The liquid release system at Battelle's West Jefferson facility regulatorily emulates a liquid effluent system rather than a sanitary sewer. Further, Battelle has committed, in the NRC license, to meet a release criteria equal to one tenth the regulatory values. The releases, then, must comply with ten percent of the concentrations listed in 10 CFR 20, Appendix B, Table 2 entitled, "Effluent Concentrations", Column 2 - "Liquids".

- This study will combine the methods of filtration, ion exchange, dilution, and time to accomplish the proposed release. Filtration will be utilized to ensure the removal of suspended solids in the water, as well as to prolong the effective life of subsequent ion exchange media. It is anticipated based upon vendor feedback that a decontamination factor (D.F.) of 5000 is readily achievable using available technology. A monthly release volume has been compiled and incorporated into this study for dilution purposes. Planning the release to span a few to several months will ultimately assure the success and compliance of this evolution.

- This study assumes the presence of suspended solids as a function of the debris and undissolved material on the bottom of the pool. Though it is purported that the entire volume is repeatedly polished certain Battelle employees at West Jefferson have explained that the filtration system only draws from approximately five feet below the surface of the water and while there is another outlet at thirty feet down it has never been valved into operation. Visual inspection of a sample taken at the forty-two foot depth seemed to readily exhibit precipitate without any chemical preparation added. Prudent practice dictates that any insoluble component be mitigated.

- It is assumed that the actual monthly liquid release volume, which is 1.40E9 milliliters per month and is used in this study as a dilution volume, would not decrease for the balance of the year but would maintain its current rate. Compiled data from the Site Environmental Report and the Ohio EPA monthly report shows monitored volumes average 1.67E9 (1993) and 1.40E9 (1994) milliliters per month (based on seven months of actual data).

- The current pool volume is conservatively approximated at 5.30E8 ml (140,000 gallons). Estimates have run from 120,000 gallons to 140,000 gallons. The current pool depth is

fully forty-two (42) feet. Simply derived, the volume per vertical foot is approximately 1.262E7 milliliters.

- It is anticipated that with pool drain-down, the walls of the pool will require pressure washing to reduce contamination which could dry, producing a significant airborne potential. Wall washing will also help keep dose rates down.

- Contaminated material dislodged from the wall may mildly increase pool concentrations but the water volume thereby introduced will serve to sufficiently dilute the material so as to negate any appreciable skewing of pool concentrations.

- Removal and/or shielding of high radiation contributors will have to be undertaken prior to the total evacuation of the pool water, which currently provides shielding. Pieces of metal and other sources have been identified as a result of an underwater grid survey performed and documented earlier this year.

- This study assumes that unity applies to this proposed effluent release. Unity means that the sum of the fractions of a nuclide's concentration divided by its corresponding release value for each nuclide released must not exceed one.

- This study has not taken credit for any monthly radionuclide release concentrations other than that represented by the pool volume itself.

- The question of Federally Protected Scenic Waterway affect on effluent release was posed to Battelle's West Jefferson E.P.A interface, John Tholen. Mr. Tholen pointed out that this recent status upgrade for the Big Darby Creek should not hinder our ability to release to the creek as it has for some time been a State Scenic Waterway without impact on Battelle's license regulated releases.

- Any time frames pursuant to release of pool water developed within this document apply only with respect to regulatory compliance and dilution capabilities. They do not reflect the time required in equipment aquisition, set up, filter/resin change out, process monitoring/sampling delay, or other such process constraints.

III. Calculations

Samples of the pool water were taken at various depths and analyzed by the Radioanalytical Laboratory (RAL). The results presented here were taken from a report prepared by Dr. Michael P. Failey, Senior Research Scientist for the laboratory, dated September 21, 1994, entitled "The Calculation of the Radionuclide content of The JN-1 Storage Pool Water".

ISOTOPE OF CONCERN	MEAN ACTIVITY uCi/ml [1]	LIQ. EFFL. CRITERIA uCi/ml	10 PERCENT OF CRITERIA uCi/ml	MONTHLY ALLOWED uCi [2]
Pu-238	9.21E-06 (3.63E-06)	2.00E-08	2.00E-09	2.8
Pu-239/240	2.22E-06 (8.75E-07)	2.00E-08	2.00E-09	2.8
Cf-252	3.20E-08 (1.26E-08)	7.00E-08	7.00E-09	9.8

Cm-244	4.02E-06	3.00E-08	3.00E-09	4.2
	(1.59E-06)			
Co-60	1.13E-05	3.00E-06	3.00E-07	420.0
Sr-90	2.43E-04	5.00E-07	5.00E-08	70.0
Y-90	2.43E-04	7.00E-06	7.00E-07	980.0
Cs-134		9.00E-07	9.00E-08	126.0
Cs-137	2.49E-04	9.00E-07	9.00E-08	126.0
Eu-154	2.74E-06	7.00E-06	7.00E-07	980.0
Np-239	9.43E-07	2.00E-05	2.00E-06	2800.0
	(3.72E-07)			
Am-241 G*	1.52E-06	2.00E-08	2.00E-09	2.8
H-3	2.90E-04	1.00E-03	1.00E-04	140000.0

G* - determined by Gamma Spectroscopy

1) Pu-238/239/240, Cf-252, Cm-244, Np-239, and Am-241 were detected by alpha spectroscopy on samples obtained at 42 feet of water. It was therefore initially necessary to assume the 42 foot concentration uniform for the entire volume. Those values, excluding americium, are expressed in the table without parentheses. Am-241 was also detected and perhaps more accurately quantified by its 59 Kev gamma photon in the samples taken at various depths in two opposing grid locations. Dr. Failey recommended that the non-gamma-quantified actinides be reduced by factoring the drop off exhibited by Am-241 at the various depths and proportionately adjusting the remaining actinides. Those values are expressed in parentheses in the following chart but replace the original values in Attachments 1 and 2.

   The strontium and yttrium values were derived from gross beta activity in the following manner. A five (5) milliliters pool water sample, drawn from the pool's recirculation system was evaporated in a planchet and counted on a Ludlum 2929 alpha beta scaler. The gross beta activity was 7.50E-4 uCi/ml. From that number the cobalt, cesium, and europium values (totaling 2.63E-4 uCi/ml) were subtracted. The resultant 4.87E-4 was evenly distributed between the Sr-90 and Y-90 as they are assumed to be in equilibrium. Accordingly, 2.43E-4 uCi/ml for each was presented above.

2) "MONTHLY ALLOWED uCi"- is based on 10 Percent of 10CFR20 liquid effluent release concentrations (in uCi/ml) multiplied by West Jefferson site's monthly average liquid effluent volume (1.4E9 ml).

Attachments 1 and 2, entitled "Unity at a Decontamination Factor of 1000" and "Unity at a Decontamination Factor of 5000" respectively, explore the issue of unity and model pool depths which may be released per month.

Simply evaluated, if we incorporate all anticipated reduction factors, those for dilution as well as filtration/ion exchange, the following table illustrates total reduction achieved for all nuclides with the exception of tritium which will only take credit for the appropriate dilution factor listed in the table.

	Feet/Mo.	Volume ml	Dilut. Factor	Combined Reduction Factor
Model #1 - DF1000	7.5	9.46 E7	14.8 to 1	6.757 E-5
Model #2 - DF5000	21.0	2.65 E8	5.28 to 1	3.786 E-5

IV. References

- Release guidance and effluent concentration limits obtained from Title 10 of the Code of Federal Regulations chapter 20, "Standards for Protection Against Radiation".
- Water sample concentrations derived from Dr. Michael P. Failey's report entitled "The Calculation of the Radionuclide content of The JN-1 Storage Pool Water", dated September 21, 1994.

V. Conclusion

It is concluded that the release of pool water from JN-1 as liquid effluent is viable utilizing ion exchange media at the heart of a comprehensive approach to water clean up. This study developed models reflecting two of the many possible decontamination factors afforded by ion exchange. The first step in the clean up process is thorough and repeated vacuuming of the pool floor to remove undissolved solids and help to functionally reduce the suspended nuclide component. Then, or at some convenient point prior to total drain-down, methodology to remove or shield source materials in the pool should be implemented. Next, systematic particulate filtration will be applied to the volume of water on its way to an ion exchange system. Ion exchange may be applied repeatedly, as necessary, to achieve the desired decontamination factor. This methodology along with assuring that the available dilution volume is maintained will enable Battelle to stay safely within our ten percent of effluent release criteria.

In summary, the two options presented herein as examples are closely tied to anticipated decontamination factors offered by available ion exchange assemblies. DF 1000 and DF 5000 are employed somewhat arbitrarily. Assemblies linked in series as well as successive recirculation of the water through ion exchange will enable many decontamination factors. The DF 1000 model will accommodate 7.5 feet of pool water per month allowing the entire pool to be evacuated within six months of actual on-line processing time. Conversely, the DF 5000 model will accommodate 21 feet of pool water per month and facilitate a total evacuation of the pool in approximately two months of actual on-line processing time.

For Review and Approval

	Name	Initials	Date
Originator	J. Sarge/S. Griffin		10-19-94
Concurrence	M. Failey		10-19-94
	G. Kirsch	DCK	10-19-94
Approved	C. Jensen		10-19-94

Attachment 1

UNITY AT A DECONTAMINATION FACTOR OF 1000

ISOTOPE OF CONCERN	MEAN ACTIVITY uCi/ml	POOL DEPTH (ft) TO BE RELEASED	TOTAL ACTIVITY in uCi at 7.5 feet	EFFLUENT RELEASE CRITERIA uCi/ml	10 PERCENT OF RELEASE CRITERIA	DF 1000 MEDIA APPLIED RESULT	AVAILABLE DILUTION MONTHLY MILLILITERS	RESULTANT CONCENTRATION uCi/ml	ACTUAL DIVIDED BY CRITERIA
Pu-238	3.63E-06	7.5	343.04	2.00E-08	2.00E-09	3.63E-09	1.4E+09	2.30E-10	0.1148
Pu-239/240	8.75E-07	7.5	82.69	2.00E-08	2.00E-09	8.75E-10	1.4E+09	5.53E-11	0.0277
Cf-252	1.26E-08	7.5	1.19	7.00E-08	7.00E-09	1.26E-11	1.4E+09	7.97E-13	0.0001
Cm-244	1.59E-06	7.5	150.26	3.00E-08	3.00E-09	1.59E-09	1.4E+09	1.01E-10	0.0335
Sr-90	2.43E-04	7.5	22963.50	5.00E-07	5.00E-08	2.43E-07	1.4E+09	1.54E-08	0.3073
Y-90	2.43E-04	7.5	22963.50	7.00E-06	7.00E-07	2.43E-07	1.4E+09	1.54E-08	0.0220
Co-60	1.13E-05	7.5	1067.85	3.00E-06	3.00E-07	1.13E-08	1.4E+09	7.15E-10	0.0024
Cs-134		7.5	0.00	9.00E-07	9.00E-08	0.00E+00	1.4E+09	0.00E+00	0.0000
Cs-137	2.49E-04	7.5	23530.50	9.00E-07	9.00E-08	2.49E-07	1.4E+09	1.57E-08	0.1749
Eu-154	2.74E-06	7.5	258.93	7.00E-06	7.00E-07	2.74E-09	1.4E+09	1.73E-10	0.0002
Np-239	3.72E-07	7.5	35.15	2.00E-05	2.00E-06	3.72E-10	1.4E+09	2.35E-11	0.0000
Am-241 G	1.52E-06	7.5	143.64	2.00E-08	2.00E-09	1.52E-09	1.4E+09	9.61E-11	0.0481
H-3	2.90E-04	7.5	27405.00	1.00E-03	1.00E-04	2.90E-04	1.4E+09	1.83E-05	0.1834
TOTALS>			98945.24			UNITY (Must be less than 1) -->			0.9143

TOTAL POOL VOLUME (140,000 GALS.)/42 FEET (POOL DEPTH) = 3333 GALS. PER FT./2.6418E-04 (GALS. TO mL) = 1.26 E 07 ml/ft.

"MEAN ACTIVITY" - DERIVED FROM POOL WATER SAMPLE ANALYSIS

"POOL DEPTH (ft) TO BE RELEASED" - THE NUMBER OF FEET OF POOL WATER THAT COULD BE RELEASED PER MONTH INCORPORATING DECON FACTOR, DILUTION, RELEASE CRITERIA, AND UNITY DETERMINATION.

"TOTAL ACTIVITY" - "MEAN ACTIVITY" X "POOL DEPTH TO BE RELEASED" X 1.26E7 ml per ft = uCi.

"EFFLUENT RELEASE CRITERIA" - COMES FROM 10 CFR 20 APP. B, TABLE 2, COLUMN 2, LIQUID EFFLUENT.

"10 PERCENT OF RELEASE CRITERIA" - REFLECTS BATTELLE'S LICENSE COMMITMENT PERTAINING TO RELEASES.

"DF 1000 MEDIA APPLIED RESULT" - THIS VALUE REFLECTS REDUCTION BASED ON THE EFFICIENCY OF THE FILTER/ION EXCHANGE MEDIA. NOTE THAT H-3 (Tritium) IS AFFORDED NO REDUCTION BY ION EXCHANGE.

"AVAILABLE DILUTION MONTHLY MILLILITERS" - BASED UPON EIGHT MONTH ACTUAL RELEASE VOLUME. IS EXPECTED TO REMAIN CONSISTENT.

"RESULTANT CONCENTRATION" - POST FILTRATION, ION EXCHANGE, AND DILUTION.
EQUATION: ("TOTAL ACTIVITY"/1000{1 FOR TRITIUM}) / (("POOL DEPTH TO BE RELEASED X 1.26 E 07 ML/FT) + "AVAIL. DILUTION")

"ACTUAL DIVIDED BY CRITERIA" - IS PRECURSOR TO THE UNITY DETERMINATION FOUND AT THE BASE OF THE COLUMN. IT IS THE "RESULTANT CONCENTRATION" DIVIDED BY THE "TEN PERCENT OF RELEASE" VALUE PRESENTED DECIMALLY.

"UNITY" - REGULATORILY, THE SUM OF THE FRACTIONS REPRESENTED IN "ACTUAL DIVIDED BY CRITERIA". MUST NOT EXCEED 1.

Attachment 2

UNITY AT A DECONTAMINATION FACTOR OF 5000

ISOTOPE OF CONCERN	MEAN ACTIVITY uCi/ml	POOL DEPTH (ft) TO BE RELEASED	TOTAL ACTIVITY in uCi at 21 feet	EFFLUENT RELEASE CRITERIA uCi/ml	10 PERCENT OF RELEASE CRITERIA	DF 5000 MEDIA APPLIED RESULT	AVAILABLE DILUTION MONTHLY MILLILITERS	RESULTANT CONCENTRATION uCi/ml	ACTUAL DIVIDED BY CRITERIA
Pu-238	3.63E-06	21	960.498	2.00E-08	2.00E-09	7.26E-10	1.4E+09	1.15E-10	0.0577
Pu-239/240	8.75E-07	21	231.525	2.00E-08	2.00E-09	1.75E-10	1.4E+09	2.78E-11	0.0139
Cf-252	1.26E-08	21	3.33396	7.00E-08	7.00E-09	2.52E-12	1.4E+09	4.01E-13	0.0001
Cm-244	1.59E-06	21	420.714	3.00E-08	3.00E-09	3.18E-10	1.4E+09	5.05E-11	0.0168
Sr-90	2.43E-04	21	64297.8	5.00E-07	5.00E-08	4.86E-08	1.4E+09	7.73E-09	0.1545
Y-90	2.43E-04	21	64297.8	7.00E-06	7.00E-07	4.86E-08	1.4E+09	7.73E-09	0.0110
Co-60	1.13E-05	21	2989.98	3.00E-06	3.00E-07	2.26E-09	1.4E+09	3.59E-10	0.0012
Cs-134		21	0	9.00E-07	9.00E-08	0.00E+00	1.4E+09	0.00E+00	0.0000
Cs-137	2.49E-04	21	65885.4	9.00E-07	9.00E-08	4.98E-08	1.4E+09	7.92E-09	0.0880
Eu-154	2.74E-06	21	725.004	7.00E-06	7.00E-07	5.48E-10	1.4E+09	8.71E-11	0.0001
Np-239	3.72E-07	21	98.4312	2.00E-05	2.00E-06	7.44E-11	1.4E+09	1.18E-11	0.0000
Am-241 G	1.52E-06	21	402.192	2.00E-08	2.00E-09	3.04E-10	1.4E+09	4.83E-11	0.0242
H-3	2.90E-04	21	76734	1.00E-03	1.00E-04	2.90E-04	1.4E+09	4.61E-05	0.4610
TOTALS>			277046.678			UNITY (Must be less than 1) -->			0.8285

TOTAL POOL VOLUME (140,000 GALS.)/42 FEET (POOL DEPTH) = 3333 GALS. PER FT./2.6418E-04 (GALS. TO mL) = 1.26 E 07 ml/ft.

"MEAN ACTIVITY" - DERIVED FROM POOL WATER SAMPLE ANALYSIS

"POOL DEPTH (ft) TO BE RELEASED" - THE NUMBER OF FEET OF POOL WATER THAT COULD BE RELEASED PER MONTH INCORPORATING DECON FACTOR, DILUTION, RELEASE CRITERIA, AND UNITY DETERMINATION.

"TOTAL ACTIVITY" - "MEAN ACTIVITY" X "POOL DEPTH TO BE RELEASED" X 1.26E7 ml per ft = uCi.

"EFFLUENT RELEASE CRITERIA" - COMES FROM 10 CFR 20 APP. B, TABLE 2, COLUMN 2, LIQUID EFFLUENT.

"10 PERCENT OF RELEASE CRITERIA" - REFLECTS BATTELLE'S LICENSE COMMITMENT PERTAINING TO RELEASES.

"DF 5000 MEDIA APPLIED RESULT" - THIS VALUE REFLECTS REDUCTION BASED ON THE EFFICIENCY OF THE FILTER/ION EXCHANGE MEDIA. NOTE THAT H-3 (Tritium) IS AFFORDED NO REDUCTION BY ION EXCHANGE.

"AVAILABLE DILUTION MONTHLY MILLILITERS" - BASED UPON EIGHT MONTH ACTUAL RELEASE VOLUME. IS EXPECTED TO REMAIN CONSISTENT.

"RESULTANT CONCENTRATION" - POST FILTRATION, ION EXCHANGE, AND DILUTION.
EQUATION: ("TOTAL ACTIVITY"/ 5000 (1 FOR TRITIUM)) / (("POOL DEPTH TO BE RELEASED X 1.26 E 07 ML/FT) + "AVAIL. DILUTION")

"ACTUAL DIVIDED BY CRITERIA" - IS PRECURSOR TO THE UNITY DETERMINATION FOUND AT THE BASE OF THE COLUMN. IT IS THE "RESULTANT CONCENTRATION" DIVIDED BY THE "TEN PERCENT OF RELEASE" VALUE PRESENTED DECIMALLY.

"UNITY" - REGULATORILY, THE SUM OF THE FRACTIONS REPRESENTED IN "ACTUAL DIVIDED BY CRITERIA". MUST NOT EXCEED 1.

ATTACHMENT E

ATTACHMENT E

SOURCE TERM CALCULATIONS FOR WEST JEFFERSON NORTH COMPLEX WITH THE VENT POINT LOCATED AT THE CENTER OF JN-1

ISOTOPES WERE OBTAINED BY UTILIZING THE RAL INVENTORY AS DOCUMENTED ON RMA'S AND A ORIGIN COMPUTER RUN OF IRRADIATED FUEL CONTAMINATION IN JN-1 HOT CELLS. ALSO, THE ISOTOPIC INVENTORY ASSOCIATED WITH THE JN-1 FUEL POOL IS ACCOUNTED FOR

Source inventory contribution by the RAL

Isotope									
C-14	Am-241	Co-60	Pb-210	Pu-242	I-129	Sr-90	Y-90	Am-243	Th-229
uCi	uCi	uCi	uCi	uCi	uCi	uCi	uCi	uCi	uCi
5.96E-01	1.80E-04	1.18E+00	5.00E+00	6.80E-05	9.66E-02	2.04E-02	2.04E-02	1.70E-02	2.40E-02
9.92E-01	6.00E-04	5.26E+00				2.70E-03			
5.41E+00	9.00E-03					1.00E-02			
	1.33E-02					1.00E-02			
	1.28E-01					1.00E-02			
	3.63E-01					1.01E+01			
	4.06E-01								
	4.40E-01								
	4.87E-01								
	6.79E-01								
	7.44E-01								
	4.92E+00								
7.00E+00	8.19E+00	6.44E+00	5.00E+00	6.80E-05	9.66E-02	1.02E+01	2.04E-02	1.70E-02	2.40E-02

Resuspension factor for liquid and particulate isotopes obtained from 40CFR61 Appendix D, (1E-3). No resuspension factor is utilized for gases..

Th-230	U-232
uCi	uCi
2.02E-03	9.17E-03

	uCi	Ci	Resuspension factor (1E-3)	Ci/yr
C-14	7.00E+00	7.00E-06	1.00E-03	7E-09
Am-241	3.19E+00	3.19E-06	1.00E-03	3.19E-09
Co-60	6.40E+00	6.40E-06	1.00E-03	6.4E-09
Pb-210	5.00E+00	5.00E-06	1.00E-03	5E-09
Pu-242	6.80E-05	6.80E-11	1.00E-03	6.8E-14
I-129	9.66E-02	9.66E-08	gas	9.66E-08
Sr-90	1.02E+01	1.02E-05	1.00E-03	1.02E-08
Y-90	2.04E-02	2.04E-08	1.00E-03	2.04E-11
Am-243	1.70E-02	1.70E-08	1.00E-03	1.7E-11
Th-229	2.40E-02	2.40E-08	1.00E-03	2.4E-11
Th-230	2.02E-03	2.02E-09	1.00E-03	2.02E-12
U-232	9.17E-03	9.17E-09	1.00E-03	9.17E-12

Source inventory contribution due to the Kr-85 sampling evolution

Kr-85 gas discharged during the Kr-85 sampling evolution averaged out over one year

Kr-85	1.73E-10	NO resuspension factor used due to being a gas					

Source inventory contribution due to the JN-1 fuel pool

The isotopes and activity concentrations for each isotope was obtained from a memo from J. Sarge to S. Layendecker dated, October 19, 1994, regarding Clean-up for release of the JN-1 fuel pool. A derivation of how the activity concentrations were derived is contained in this memo.

The fuel pool volume is 5.3E8 ml

Isotope	Activity concentration uCi/ml	volume	uCi	Ci	resuspension factor	Ci
Pu-238	3.63E-06	5.30E+08	1923.9	1.92E-03	1.00E-03	1.92E-06
Pu-239	8.75E-07	5.30E+08	463.75	4.64E-04	1.00E-03	4.64E-07
Pu-240	8.75E-07	5.30E+08	463.75	4.64E-04	1.00E-03	4.64E-07
Cf-252	1.26E-08	5.30E+08	6.678	6.68E-06	1.00E-03	6.68E-09
Cm-244	1.59E-06	5.30E+08	842.7	8.43E-04	1.00E-03	8.43E-07
Sr-90	2.43E-04	5.30E+08	128790	1.29E-01	1.00E-03	1.29E-04
Y-90	2.43E-04	5.30E+08	128790	1.29E-01	1.00E-03	1.29E-04
Co-60	1.13E-05	5.30E+08	5989	5.99E-03	1.00E-03	5.99E-06
Cs-137	2.49E-04	5.30E+08	131970	1.32E-01	1.00E-03	1.32E-04
Eu-154	2.74E-06	5.30E+08	1452.2	1.45E-03	1.00E-03	1.45E-06
Np-239	3.72E-07	5.30E+08	197.16	1.97E-04	1.00E-03	1.97E-07
Am-241	1.52E-06	5.30E+08	805.6	8.06E-04	1.00E-03	8.06E-07
H-3	2.90E-04	5.30E+08	153700	1.54E-01	1.00E-03	1.54E-04

The resuspension factor for liquid and particulate isotopes is obtained from 40CFR61, Appendix D

An adjustment factor of 0.01 is obtained from 40CFR61, Appendix D to take credit for HEPA ventilation JN-1 building exhausts through HEPA filtered ventilation

Isotope	Ci	adjustment factor	Ci/yr
Pu-238	1.92E-06	0.01	1.92E-08
Pu-239	4.64E-07	0.01	4.64E-09
Pu-240	4.64E-07	0.01	4.64E-09
Cf-252	6.68E-09	0.01	6.68E-11
Cm-244	8.43E-07	0.01	8.43E-09
Sr-90	1.29E-04	0.01	1.29E-06
Y-90	1.29E-04	0.01	1.29E-06
Co-60	5.99E-06	0.01	5.99E-08
Cs-137	1.32E-04	0.01	1.32E-06
Eu-154	1.45E-06	0.01	1.45E-08
Np-239	1.97E-07	0.01	1.97E-09
Am-241	8.06E-07	0.01	8.06E-09
H-3	1.54E-04	0.01	1.54E-06

Isotopes from hot cells	Ci/yr	Isotopes from RAL & Kr-85 sampling Ci/yr	Fuel Pool Ci/yr	Source Term Total Ci/yr
Sr-90	5.98E-07	1.02E-08	1.29E-06	1.90E-06
Y-90	5.98E-07	2.04E-11	1.29E-06	1.89E-06
Tc-99	1.39E-10			1.39E-10
Cd-113m	3.91E-10			3.91E-10
Sb-125	1.29E-08			1.29E-08
Te-125m	3.13E-09			3.13E-09
I-129	3.42E-08	9.66E-08		1.31E-07
Cs-134	9.80E-08			9.80E-08
Cs-137	1.80E-06		1.32E-06	3.12E-06
Pr-144	1.60E-09			1.60E-09
Pm-147	9.95E-08			9.95E-08
Sm-151	3.21E-09			3.21E-09
Eu-154	5.14E-08		1.45E-08	6.59E-08
Eu-155	1.76E-08			1.76E-08
U-233	2.95E-16			2.95E-16
Np-237	3.35E-12			3.35E-12
Np-238	3.75E-13			3.75E-13
Np-239	2.07E-10		1.97E-09	2.18E-09
Pu-236	6.04E-13			6.04E-13
Pu-238	2.59E-08		1.92E-08	4.51E-08
Pu-239	3.36E-09		4.64E-09	8.00E-09
Pu-240	5.76E-09		4.64E-09	1.04E-08
Pu-241	8.62E-07			8.62E-07
Pu-242	2.01E-11	6.80E-14		2.02E-11
Pu-244	5.48E-18			5.48E-18
Am-241	1.88E-08	3.19E-09	8.06E-09	3.50E-08
Am-242m	7.49E-11			7.49E-11
Cm-242	6.18E-11			6.18E-11
Cm-243	1.98E-10			1.98E-10
Cm-244	1.68E-08		3.43E-09	2.53E-08
Cm-245	1.92E-12			1.92E-12
Cm-246	4.31E-13			4.31E-13
Cm-247	1.21E-18			1.21E-18
Cm-248	2.35E-18			2.35E-18
Cm-250	3.22E-25			3.22E-25
Cf-249	2.86E-17			2.86E-17
Cf-250	8.86E-17			8.86E-17
Cf-251	8.35E-19			8.35E-19
H-3	5.03E-09		1.54E-06	1.55E-06
C-14	6.68E-12	7.00E-09		7.01E-09
Mn-54	5.42E-15			5.42E-15
Fe-55	8.06E-12			8.06E-12
Ni-59	1.42E-13			1.42E-13
Co-60	1.01E-08	6.80E-09	5.99E-08	7.68E-08
Ru-106	6.24E-09			6.24E-09
Ce-144	1.60E-09			1.60E-09
Sb-125	5.78E-09			5.78E-09

Ni-63	1.81E-11					1.81E-11
U-235	1.95E-09					1.95E-09
U-238	8.61E-09					8.61E-09
U-234	5.63E-08					5.63E-08
Pb-210		5.00E-09				5.00E-09
U-232		9.17E-12				9.17E-12
Th-230		2.02E-12				2.02E-12
Th-229		2.40E-11				2.40E-11
Am-243	2.07E-10	1.70E-11				2.24E-10
Kr-85		1.73E-10				1.73E-10
Cf-252					6.68E-11	6.68E-11
Resuspension factor of 1E-3 used in calculations for the hot cell isotopes of liquid or particulate form						
No resuspension factor is utilized for gases						
An adjustment factor od 1E-2 is also utilized to take credit for Hepa filter ventilation.						
These factors are cited for use in 40CFR61 Appendix D						

ATTACHMENT F

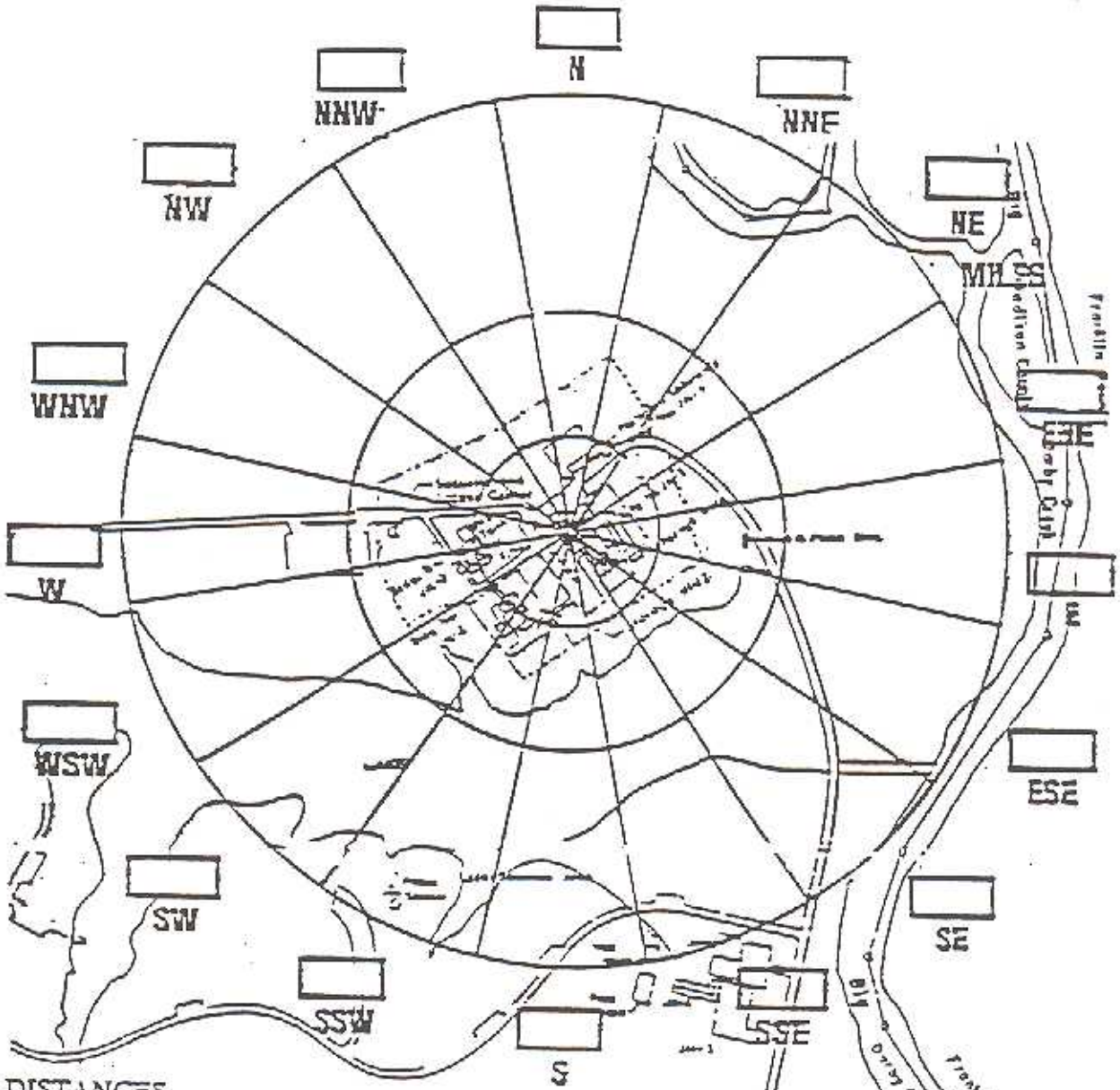
ATTACHMENT F

BATTELLE WEST JEFFERSON
NORTH SITE — BUILDING ELEVATIONS

Building No.	Approximate Grade Elevation	First Floor Slab Elevation	Approximate Building Height	Approximate First Roof Elevation	Comment
Old JN-1	906	909	25'4"	934.25	
JN-1 High Bay	906	910.15	62'2"	996.42	62 feet (19 M) used as stack height since stack is short and has a deflector that directs the flow downward. The building height and release height are 19 meters.
JN-2	908	909	24'	933	
JN-2 High Bay	908	909	49'3.1"	958.26	
JN-3	908.5	909.6	24'	933.6	
JN-3 High Bay	908.5	909.6	38.6'	948.2	

ATTACHMENT G

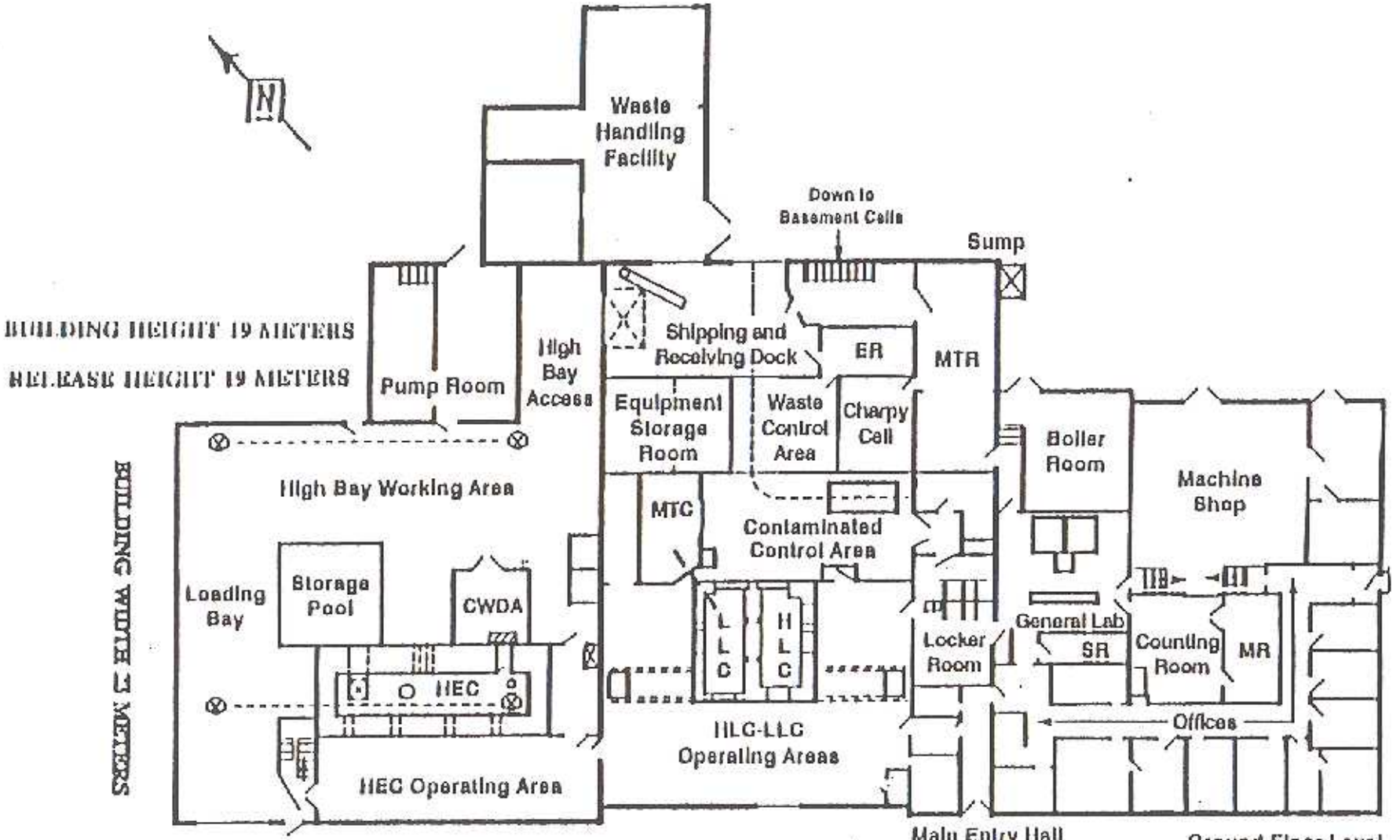
ATTACHMENT G



STACK DISTANCES

DIR	Distance (meters)
N	1000.0
NNE	500.0
NE	500.0
ENE	1000.0
E	1000.0
ESE	1250.0
SE	1750.0
SSE	1750.0
S	2500.0
SSW	1000.0
SW	2000.0
WSW	2000.0
W	4000.0
WNW	2500.0
NW	1000.0

ATTACHMENT H



BUILDING JN-1B

BUILDING LENGTH 24 METERS

ATTACHMENT I

ATTACHMENT I

WINDROSE DATA, MODIFIED FILE: C:\rose\rose.dat

Source of Wind Rose Data: National Climatic Data Center, Ashville, NC
Dates of Coverage: 1965-1974
Wind Rose Location: Columbus, Ohio, Port Columbus International Airport
Distance to Facility: Less than 25 miles

Percent Calm: 0.03

Wind FROM	Speed	
	Frequency	Meters/s.
N	0.096	3.70
NNE	0.038	3.40
NE	0.039	3.30
ENE	0.036	3.30
E	0.061	3.20
ESE	0.061	3.40
SE	0.061	3.90
SSE	0.058	3.60
S	0.123	4.20
SSW	0.059	5.20
SW	0.055	5.70
WSW	0.050	5.90
W	0.088	5.70
WNW	0.051	5.40
NW	0.043	4.90
NNW	0.047	4.30

Distance from the SOURCE to the FARM producing VEGETABLES is 150 meters.

Distance from the SOURCE to the FARM producing MILK 4828 meters.

Distance from the SOURCE to the FARM producing MEAT is 12875 meters.

ATTACHMENT J

COMPLY: V1.5d. 4/ 6/95 11:10

40 CFR Part 61
National Emission Standards
for Hazardous Air Pollutants

REPORT ON COMPLIANCE WITH

THE CLEAN AIR ACT LIMITS FOR RADIONUCLIDE EMISSIONS

FROM THE COMPLY CODE, VERSION 1.5d

Prepared by:

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CRAIG JENSEN
(614) 424-5170

Prepared for:

U.S. Environmental Protection Agency
Office of Radiation Programs
Washington, D.C. 20460

COMPLY: V1.5d. 4/ 6/95 11:10

REPORT ON COMPLIANCE WITH THE CLEAN AIR ACT LIMITS FOR RADIONUCLIDE EMISSIO

SCREENING LEVEL 4

DATA ENTERED:

Nuclide		Release Rate (curies/YEAR)
SR-90	Y	1.900E-06
Y-90	Y	1.890E-06
TC-99	W	1.390E-10
CD-113M	D	3.910E-10
SB-125	W	1.290E-08
TE-125M	W	3.130E-09
I-129	D	1.310E-07
CS-134	D	9.800E-08
CS-137	D	3.120E-06
PR-144	Y	1.600E-09
PM-147	Y	9.950E-08
SM-151	W	3.210E-09
EU-154	W	6.590E-08
EU-155	W	1.760E-08
U-233	Y	2.950E-16
NP-237	W	3.350E-12
NP-238	W	3.750E-13
NP-239	W	2.180E-09
PU-236	W	6.040E-13
PU-238	W	4.510E-08
PU-239	W	8.000E-09
PU-240	W	1.040E-08
PU-241	W	8.620E-07
PU-242	W	2.020E-11
PU-244	W	5.480E-18
AM-241	W	3.500E-08
AM-242M	W	7.490E-11
CM-242	W	6.180E-11
CM-243	W	1.980E-10
CM-244	W	2.530E-08
CM-245	W	1.920E-12
CM-246	W	4.310E-13
CM-247	W	1.210E-18

CM-248	W	2.850E-18
CM-250	W	3.220E-25
CF-249	W	2.860E-17
CF-250	W	8.860E-17
CF-251	W	8.350E-19
H-3	V	1.550E-06
C-14	1	7.010E-09
MN-54	W	5.420E-15
FE-55	D	8.060E-12

COMPLY: V1.5d. 4/ 6/95 11:10

NI-59	V	1.420E-13
CO-60	Y	7.680E-08
RU-106	Y	6.240E-09
CE-144	Y	1.600E-09
SB-125	W	5.780E-09
NI-63	V	1.810E-11
U-235	Y	1.950E-09
U-238	Y	8.610E-09
U-234	Y	5.630E-08
PB-210	D	5.000E-09
U-232	Y	9.170E-12
TH-230	W	2.020E-12
TH-229	W	2.400E-11
AM-243	W	2.240E-10
KR-85		1.730E-10
CF-252	Y	6.680E-11

Release height 19 meters.

Building height 19 meters.

The source and receptor are not on the same building.

Building width 23 meters.

Building length 26 meters.

STACK DISTANCES, FILE: 95NDIS

DIR	Distance (meters)
N	1000.0
NNE	500.0
NE	500.0
ENE	1000.0
E	1000.0

ESE	1250.0
SE	1750.0
SSE	1750.0
S	2500.0
SSW	1000.0
SW	2000.0
WSW	2000.0
W	4000.0
WNW	2500.0
NW	1000.0
NNW	1250.0

COMPLY: V1.5d. 4/ 6/95 11:10

WINDROSE DATA, FILE: 95NWR

Source of wind rose data: National Climatic Data Center, Ashville, N.C
Dates of coverage: 1965-1974
Wind rose location: Columbus Ohio, Port Cols Int. Airport
Distance to facility: 25 miles

Percent calm: 0.03

Wind FROM	Frequency	Speed (meters/s)
N	0.096	3.70
NNE	0.038	3.40
NE	0.039	3.30
ENE	0.036	3.30
E	0.061	3.20
ESE	0.061	3.40
SE	0.061	3.90
SSE	0.058	3.60
S	0.123	4.20
SSW	0.059	5.20
SW	0.055	5.70
WSW	0.050	5.90
W	0.088	5.70
WNW	0.051	5.40
NW	0.043	4.90
NNW	0.047	4.30

Distance from the SOURCE to the FARM producing
VEGETABLES is 150 meters.

Distance from the SOURCE to the FARM producing
MILK is 4828 meters.

Distance from the SOURCE to the FARM producing
MEAT is 12875 meters.

NOTES:

The receptor exposed to the highest concentration is located
500. meters from the source in the NNE sector.

He gets his VEGETABLES from a farm located
150. meters from the source in the N sector.

He gets his MEAT from a farm located
12875. meters from the source in the N sector.

He gets his MILK from a farm located
4828. meters from the source in the N sector.

Input parameters outside the "normal" range:

COMPLY: V1.5d. 4/ 6/95 11:10

Meat farm is unusually FAR.
Stack file distance is unusually FAR.

RESULTS:

Effective dose equivalent: 1.4E-04 mrem/yr.

Effective dose equivalent: 7.4E-06 mrem/yr due to Iodine.

*** Comply at level 4.

This facility is in COMPLIANCE.

It may or may not be EXEMPT from reporting to the EPA.

You may contact your regional EPA office for more information.

********** END OF COMPLIANCE REPORT **********